THE

ELECTRICAL REVIEW

Volume CXXVI. No. 3265

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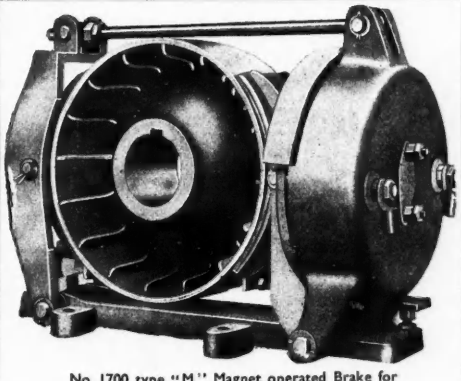

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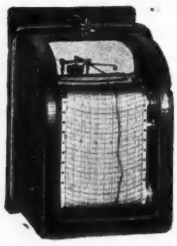

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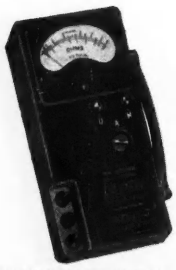

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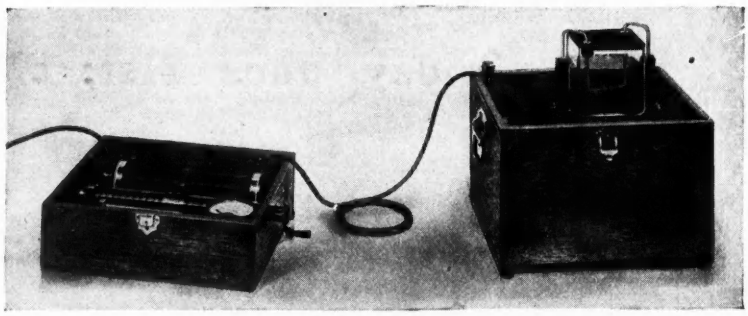

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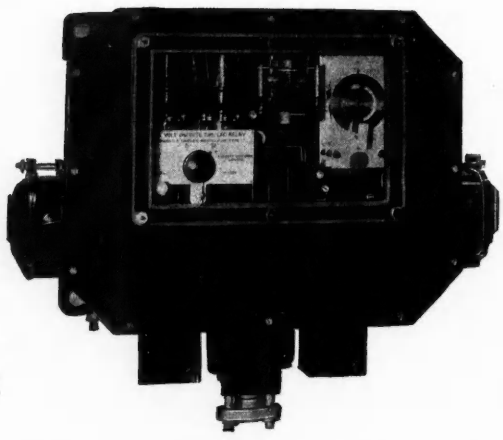

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Vol. CXXVI. No. 3265 JUNE 21, 1940 Price SIXPENCE

The Younger Generation

Examinations and Experience

ALTHOUGH the urgency of the hour makes the chief claim on our energies, yet our very confidence in the outcome of the struggle entails the need to spare some thought for the future. When the time comes to take up the task of restoring national prosperity an important question will be whether the Institution of Electrical Engineers stands for all that its title implies.

The chief criterion of ultimate healthy development is the way in which younger engineers regard their professional obligations. Graduates and Students are growing in numbers at a relatively greater rate than are members in other classes of the I.E.E., and this, at first glance, promises well. While from the standpoint of the Institution's finances it results in a lower overall income per head, at the same time entailing expenditure on special facilities for a section of the membership, it is a liability that should willingly be incurred by any professional institution that hopes to endure, provided the purpose in view is adequately served.

Graduates' Qualifications

Doubts arise on this point from the consideration that nearly as many Students resign or lapse each year as reach Graduate rank, and that of those who succeed in doing so about a third drop out of the running before reaching the goal of corporate membership. That so many Graduates should fall away after taking the trouble to pass the stiff Institution examination is surprising. Probably the most common reason, as appeared from a discussion in our columns a couple of years ago, is the fairly common lack of appreciation that a Graduate's technical qualifications are the same as those of an Associate Member, which he would become after having held a position of responsibility.

While membership of the Institution ought to be regarded in the first place as a professional privilege, it is only natural for the ambitious young engineer to hope that it will lead to a proper recognition of his status as a means to securing his livelihood and professional advancement. Yet many of the posts advertised are restricted to corporate members, when a Graduate's qualifications would have been quite suitable. He is thus deprived of the opportunity of undertaking the responsibility that would later entitle him to be called a "chartered electrical engineer." A step taken by the Council of the I.E.E. last November, in changing the name of the "Graduateship examination" to the "Associate Membership examination" (without any other modification), should go a long way towards establishing the claims of the Graduate, since it makes it immediately obvious that his technical knowledge reaches the highest standard required by the Institution.

Any step that improves the position of Graduates is also an inducement to Students to take seriously the study entailed in fitting themselves for the next stage. While the wastage in their ranks may be partly due to the impulsive acceptance of positions in industry before completion of training, we believe that the chief cause lies in failure to pass the A.M.I.E.E. examination. Among the unsuccessful candidates are surely more than a few who ought to be retained in the Institution. Many people possessing considerable engineering and organising ability appear to be temperamentally incapable of doing well in written examinations. In some ways they are akin to Associates (as distinct from Associate Members) who have shown their worth by reason of experience despite academic handicaps.

Students and Responsibility

Students by the time they are twenty-eight years of age (when they must leave the I.E.E. if not qualified for promotion) have rarely been for long enough in a position of responsibility to satisfy the standard of the Associate class in that respect, but they should have given some evidence by then of their aptitude, and this might be taken into account instead. Incidentally, the question of what constitutes "responsibility" is in itself a most difficult one in so heterogeneous an industry as ours and is by no means settled in a way that satisfies all cases.

The Associate class is a relatively small body and its number is practically stationary. Many tests of a Student's fitness for promotion to this class (in default of his becoming an Associate Member) suggest themselves. He may have done fairly well in the A.M.I.E.E. examination, though not well enough to secure the requisite number of marks. He might do quite well in an oral test, similar to that imposed by the Association of Mining Electrical Engineers. His proficiency in terms' work at college

or technical school, as distinct from a good showing in the final examination, and later the progress he makes in an industrial position are also factors which could well be taken into account. It is highly desirable that, both now and in the future, the I.E.E., while maintaining strictly its present standards of corporate membership, should be in a position to represent and organise the technical interests of all who have the right to be termed electrical engineers.

Commissioners in Control

THE Order made by the Minister of Transport authorising the Electricity Commissioners to assume control of the undertakings of the Lincolnshire & Central Electric Supply Co., Ltd., and its subsidiaries, as "undertakings having foreign associations," is the first of its kind to be issued. The chairman and the general manager are respectively G. Volpi Conte di Misurata (who is connected with the Società Adriatica di Elettricità) and Count Cesare Cicogni. The bulk of the issued ordinary capital is held by the European Electric Management Corporation, Ltd., of St. Johns, Newfoundland. The Commissioners have placed a member of a well-known firm of accountants in charge of the undertakings.

Increased Charges

THE Electricity Commissioners have prepared for the Minister of Transport a very comprehensive statement setting out in tabular form the increases in prices for electricity made by over 160 electricity supply authorities since the beginning of the war. Increased charges to large industrial consumers are not included. It has taken five months to secure and collate the information, and even now it is thought that it may be incomplete, but the results occupy sixteen double foolscap sheets. If it is asked what useful purpose can be served by the statement, we are at a loss for an answer, but it was prepared at the request of certain members of Parliament who will no doubt be highly gratified at the result.

Mutual Aid

THE Central Electricity Board and the Electricity Commissioners have their plans for ensuring the continuity of supply in the event of damage to systems as the result of air raids, but there is a great deal which neighbouring undertakings can arrange between themselves in the way of immediate assistance to one another, largely in matters of detail. We reported some time ago that a number of London undertakings had discussed the matter, and in this issue we are able to give some particulars of the scheme which has been evolved as a result of these discussions. We also publish a letter from Mr. F. A. Avery, of the Sussex Electrcity Supply Co., drawing attention to arrangements made by several Sussex undertakings and suggesting that the formation of similar groups in other parts of the country should be encouraged. Closely akin to this subject are the plans made on the North-East Coast and elsewhere for the formation of pools of industrial electrical plant.

Pooling Reserve Plant

ATTENTION has been drawn in the lay Press to the position of industrial centres in Italy, around Turin, Milan and Genoa, in relation to the supply of power. The main sources of this power are hydro-electric stations in the Alps from which energy is transmitted for considerable distances to factories and also to railways. Destruction of the power stations, main switching stations or overhead lines would no doubt appreciably hamper the operations of the enemy. Comparison with the British grid is inevitable, but a fundamental difference between the two should be borne in mind. Our grid is essentially a system for the duplicate interconnection of generators by means of extended busbars, as it were, with a view to pooling reserve capacity and using the most efficient units to produce the bulk of the country's output. As in normal times, it takes an average of four years to construct a new station and nearly three to extend an existing one on modern lines, the value of having a flexible reserve is apparent. Sectionalisation of the grid, also, enables smaller areas to be run independently if need be, thermal efficiency being disregarded when it conflicts with reliability. Freedom from troubles in the event of air attack is not to be expected, but these would not be of the same serious character as they could be if large blocks of power had to be transmitted from generators remote from the consuming points.

Cable Makers in 1939

THE reports of the cable manufacturing companies indicate that last year was a good one for practically all of them. Where profits showed a decrease the fall was of no great dimensions, while the surpluses of some of them were very substantially higher—notably in the cases of Johnson & Phillips (who raised their ordinary dividend from 12½ to 15 per cent.) and Callender's. With the restrictions which have been placed on extensions of distribution systems a good deal of normal business will be lost, but it should be balanced by demands for cables for essential services and production for export.

Moisture Control

WHILE the value of air conditioning for comfort is becoming widely recognised, its possibly greater potentialities in other directions have not yet received the attention they merit. Last year a blast furnace in Alabama rated at 500 tons of pig iron per day was equipped with 500-ton refrigerating plant to maintain a predetermined dew point, 42 deg. F. approximately, for the 2,700 tons of air per day supplied to the blowers. The electrical input to the conditioning plant would probably be more than 700 kW. According to the *Edison Electric Institute Bulletin*, the results achieved have been so satisfactory that a second furnace is being similarly equipped.

Faulty Rubber Gloves

ROUTINE tests of rubber gloves at high voltage DC have been found by the Boston Edison Co. to be considerably more reliable than AC tests at 10 kV accompanied by visual inspection. The AC high-voltage and leakage resistance tests have failed to reveal minor mechanical defects, whereas the DC method is said to yield more uniform results than does even critical visual inspection and removal of the human element is a decided advantage where safety of the user is involved. A further advantage is that the number of gloves condemned each year has been reduced by nearly a half. It would appear from the results obtained that where a routine DC test has been adopted it is hardly worth while to retain the AC test.

Negative Bias

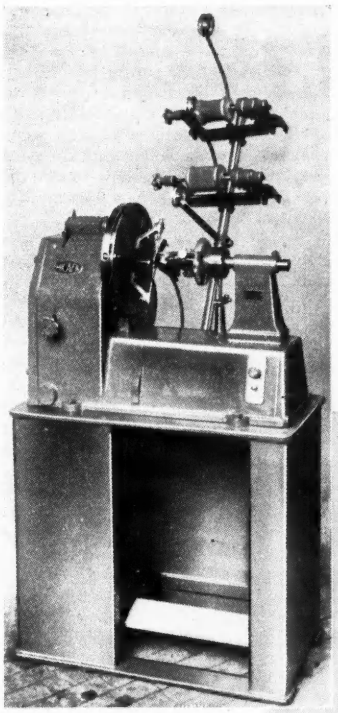
ELECTROLYTIC action due to stray currents passing from metal to soil provides the chief cause of the corrosion of long pipe lines. In Canada valuable protection has been afforded by giving the pipes an artificial negative potential, according to *Electrical News and Engineering* (Toronto). This introduces the difficulty that corrosion of other buried metal-work in the vicinity, such as lead sheaths of cables, may be intensified unless they can all be included in the protective system. There are other difficulties, too, as Dr. W. G. Radley and Mr. C. E. Richards showed in an I.E.E. paper last year, such as the possibility of damage to lead-sheathed cables in some localities due to alkali produced by cathode currents. On the other hand, the method has been found to mitigate the effects of direct chemical attack by water in the soil and also to prevent electrolytic action by stray traction currents. Much blame used to be thrown on tramways, but actually in several cities in the United States, as the authors referred to have stated, corrosion on telephone cables increased with the closing down of the track to which the networks had been electrically drained.

WINDING-SHOP PRACTICE

Recent Advances

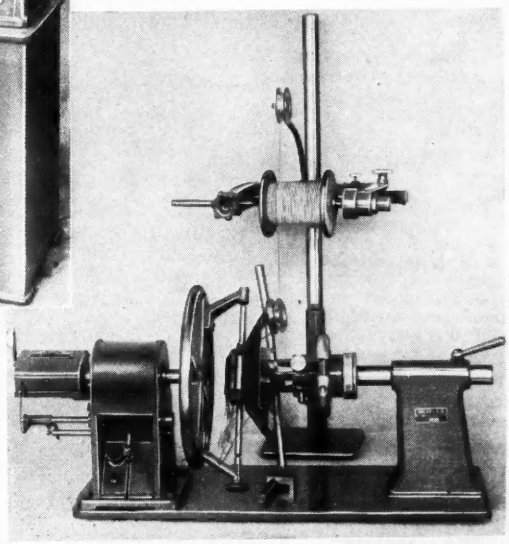
By "Ogbourne"

PROGRESSIVE increase in the demand for electric motors for industrial and domestic uses during recent years has enabled, or even forced, manufacturers to adopt the most up-to-date methods, including in many cases the use of specialised plant for doing one job only. The greatest scope for high-speed production is in the machining and assembly side of the business. Winding comes under a somewhat different category and, compared with most mechanical operations, calls for considerable skill. One operator may be engaged on one job for many hours on end, so that any saving in winding cost is likely to be worth while.



(1) Fully automatic armature winding machine

The scope for the introduction of improved manufacturing methods depends on the size of the machine being made. Windings for up to about ¼-HP machines are simple and comparatively small, and the demand is big so that mass production methods are in evidence. Above ¼ HP the windings become heavier, more complicated and depend more on the individual skill of the winder, and while such extensive mass production methods may not be practicable, the introduction of efficient methods and the avoidance of waste effort is more than ever desirable. In this article winding practice will be considered under four headings, viz., armatures, coils, stators and squirrel-cage rotors.



(2) Semi-automatic armature winding machine

Armature and Stator Cores

Armature and stator cores have not differed appreciably in construction over many years. They are usually ground, internally or externally as the case may be, sometimes before and sometimes after winding. The former is often necessary where special-winding machines are used, but as the varnish has to be cleaned away after dipping, most manufacturers turn or grind after winding. This has the added advantage that the wedged winding holds the teeth up against the pressure of the finishing tool.

No appreciable alterations in varnishing technique are apparent. On account of their greater flexibility, oil-base varnishes are generally preferred to the synthetic-resin base varnishes, but the latter are used to a great extent, particularly where a solid job is wanted.

Vacuum impregnating and simple dipping both have their adherents. Generally speaking, mass-produced small windings for use in this country are dipped, while windings for small machines for export and most of those for industrial motors are vacuum impregnated. Double cotton continues to be the most favoured insulation for the latter. Double-silk-covered wire is often used in small armatures owing to its better space factor.

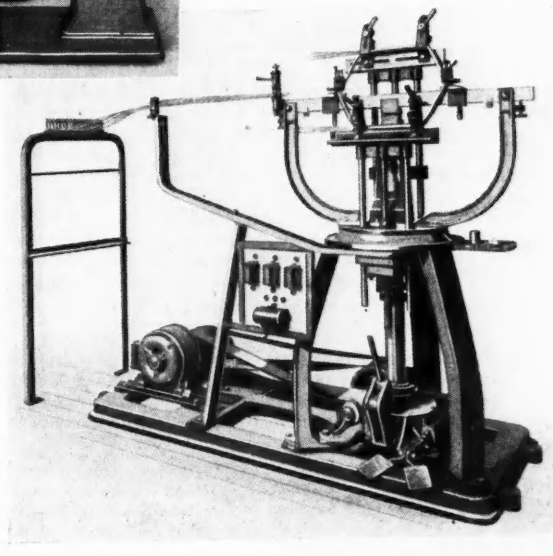
Single-phase AC stators are commonly wound with enamelled wire in which great improvement has been made during recent years both as regards insulating qualities and resistance to softening during varnishing. The introduction of paper- and enamel-insulated wire has enabled a better space factor to be obtained than with a cotton-covered wire, without having to rely on enamel only.

The most recent advance in wire insulation is a covering of glass in fibre form; it can withstand a much greater heat than other types of insulation. Motors can therefore be made either to give a greater output (with greater but equally safe temperature rise) from the same frame size or to have a greater margin of safety against excessive temperature rise due to prolonged overload or other causes. Glass-insulated motors have not long appeared in this country and it is early to say just how insulation technique will be affected by results obtained from those in service.

As to large machines, slot-insulation practice has not varied for many years. A layer of varnished cloth and a layer of fibrous paper is standard for small low-voltage machines while in larger sizes a mica and paper troughing is usual. In smaller machines, including single-phase stators, there is a tendency to do away with varnished cloth and to rely on one thickness of fibrous-paper only. The cells of this material are usually reinforced at the ends and are frequently produced by machine. Slot wedges of hardwood are used in larger motors. In smaller cores thick fibrous paper is used, or sometimes the wedge is dispensed with altogether, the varnish being relied upon to keep the slot insulation below the level of the air gap.

Armature Winding

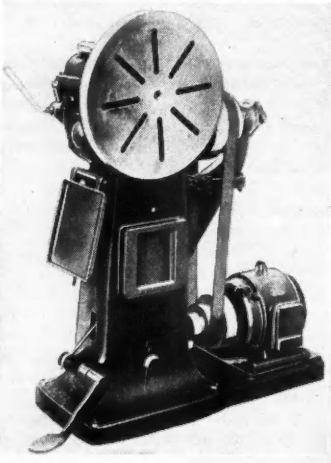
Armatures for motors of above about ¼ HP are invariably former-wound with pre-wound and taped coils. The coils are often wound in gangs, the smaller



(3) An example of a coil-winding and spreading machine designed for the production of wire and strip-wound coils belt-driven by small motor

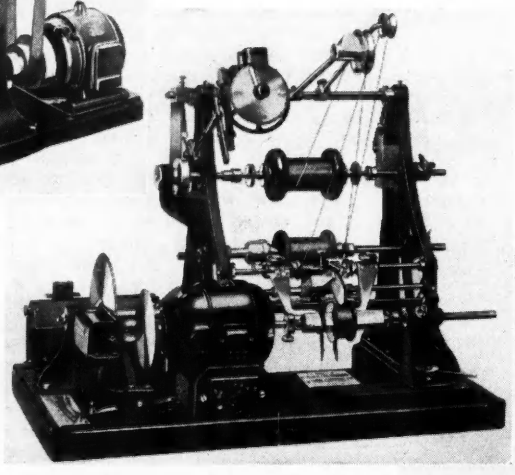
the coil the greater the number wound at one time. To permit them to be removed readily, the former is arranged so as to be easily collapsible. The taping process is usually done by machine except with very small coils, for which hand taping is quicker and more efficient on account of the restricted amount of space for the operation of the machine. Subsequent assembly of the coils into the slots of the armature core is done by hand. Small armatures for portable tools, vacuum cleaners and other domestic appliances are almost invariably machine wound.

Comfortable seating and lighting, correct bench height, adequate supply of tools and materials always ready to hand, elimination of unnecessary movement, rest periods, bonus payment schemes, and welfare and sports facilities have all contributed to better and cheaper windings and have in many cases enabled female labour to be employed on windings of greater size than formerly.



(4) Winding machine for heavy field coils

In the semi-automatic machine (2) the armature is clamped endwise and guides are provided to lead the wire into the slot. A turn counter is fitted on the extreme left and the machine stops automatically when the required number of turns have been wound into the slot. Changing from slot to slot is done by hand. With the fully-automatic type of winding machine (1) the operator has only to insert the core; the machine then proceeds to wind the armature and does not stop until it is completed. In the machines illustrated the armature is rotated, but there are other types in which the armature is held stationary and the wire wound into it from a rotating arm. Armatures for repulsion-induction motors are frequently machine wound, but call for a more complex machine as the windings are usually four or six pole.



(5) Machine for winding small coils singly

In connecting up the armature winding to the commutator gas-heated plain soldering irons are generally preferred as they are heavy and entail little cost of maintenance. An improvement is a gas-heated vertical bit which is brought into contact with the commutator by pressure on a foot pedal. This method is speedy and leaves both hands free. Another common method of soldering for small armatures is to dip the commutator bodily into molten solder up to the level of the top of the lugs. Metal parts not to be soldered are protected by means of painting with whitening or similar material.

Stator Winding

The development of domestic appliances, such as refrigerators and washing machines driven by ⅛- and ¼-HP single-phase induction motors, has resulted in greater attention being directed to the economical winding of smaller sizes of stator.

In general, the coils are now former-wound on high-speed automatic machines in groups of three or four coils, each group forming one pole winding of the motor, without break in the wire between individual coils. The coils are then inserted one at a time in the stator slots. In the case of single-phase motors taping of the coils after inserting is generally dispensed with.

Automatic stator winding has been developed to some extent in which the whole of the copper is wound direct into the slots by machine without the need of a skilled winder and at much greater speed than by hand insertion.

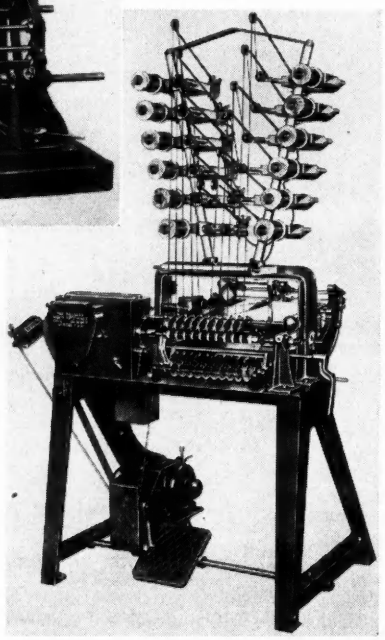
Larger stators are wound with pre-formed and taped coils assembled into the slots by hand. The winding and spreading machine (3) allows the coils to be wound in a horizontal plane; while the two ends are tightly clamped lead screws are set in operation (by means of a foot pedal) which stretch the coil into a nearly vertical position. The machine is adjustable so that any required size of coil, within its range, can be produced, and when once set any number of similar coils can be made.

The winding of medium and large field coils with heavy-gauge wire or strip calls for a robust winding machine that is flexible as regards setting up and easily controlled (4), so as to deal with numerous sizes and specifications. Wound coils are generally taped by machine.

A number of machines have been developed for turning out small field coils on a mass production basis. Such machines have a high winding speed, quick acceleration and braking, automatic stopping when the winding is completed, or if the wire breaks, and tensioning devices which permit the wire to be handled at high speeds without stretching or breaking. Some manufacturers wind a number of coils simultaneously but, as most series motors have a comparatively small number of turns, it is a matter for argument as to whether it is worth winding more than one field coil at a time. A machine for winding small coils singly is illustrated (5).

Machine taping of very small field coils is not generally practicable owing to lack of space, and hand taping is usually resorted to. Sometimes instead of winding on a former and taping, the wire is wound on to a card spool which is assembled into the motor.

The winding of magnet coils having a large number of turns of comparatively small gauge wire has been brought to a fine art—to a great extent as the result of the demand for such coils in the radio industry. Modern practice is to wind a number of coils simultaneously, *e.g.*, ten at a time. The machines run at from 2,000 to 3,000 RPM and are fitted with automatic stop features and also with a device for automatically cutting off and feeding a strip of paper between each layer of the winding if required.



(6) Fully automatic multi-winder for magnet coils

There are two broad types of coil construction in use. In one the wire is wound into a moulded or card bobbin, the bobbins being threaded on to one long spindle and wound with or without paper interleaving. The other type has a central insulated core only in one long length. The ten coils are wound simultaneously and between each layer of winding there is inserted a piece of insulating paper of the same width as the centre core. When the set of coils is finally wound and the ends tied off, a set of circular knives comes forward and cuts the length into the required ten coils. After impregnating, the coils may be finished off by taping or left as they come from the machine according to the degree of protection necessary. A multi-coil winder of this type is shown in (6).

Two types of squirrel-cage rotor winding are in general use, one in which the conductors and end rings are of copper and the other in which the whole winding and probably the ventilating fan as well is made of one solid aluminium casting.

(*Concluded at foot of opposite page.*)

STATIC FREQUENCY-CONVERSION

Problem of Reactive Volt-amperes

By R. Feinberg (Manchester University)

THE method of frequency changing employing mercury-arc mutators* has given rise to the following fundamental questions: (1) what happens to the reactive volt-amperes of the secondary AC network when transferred to the primary AC network of higher frequency; and (2) how is it possible to transmit reactive volt-amperes through a DC circuit linking these two AC networks? The present article aims at presenting a solution of this basic problem.

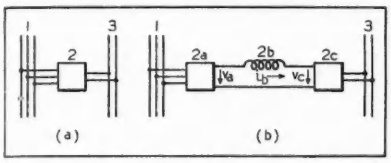


Fig. 1.—Conversion of three-phase AC to single-phase at lower frequency

(a) Direct-coupling mutator frequency convertor
(b) Mutator frequency-convertor with intermediate direct voltage
1. Primary AC network
2. Mutator convertor (2a, input mutator; 2b, inductor and DC circuit; 2c, output mutator; v_a input direct voltage; v_c, output direct voltage; i_b, direct current)
3. Secondary AC network

In fig. 1 is shown schematically the circuit arrangements for two types of mutator frequency convertors. The convertor of (a) changes three-phase AC directly to single-phase AC of lower frequency; the convertor of (b) includes an intermediate DC link.

Assume inductive load and sinusoidal voltage in the secondary network. In fig. 2 the voltage $v=V\sqrt{2}(\sin \omega t)$, the reactive current $i_r=I\sqrt{2}\sin\phi\,(-\cos.\omega t)$, and the instantaneous reactive volt-amperes $p_r=VI\sin\phi\,(-\sin 2\,\omega t)$. The latter represents a power oscillation of amplitude $VI\sin\phi$, a value which coincides with the RMS of the secondary reactive volt-amperes.

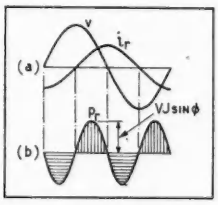


Fig. 2.—Inductive reactive volt-amperes in the secondary network

(a) Voltage v and reactive current i_r
(b) Instantaneous power p_r of the reactive volt amperes

The vertically shaded areas of fig. 2 (b) indicate energy delivered by the convertor to the secondary network, while the horizontally shaded areas represent energy transported in the reverse direction. The problems then arising are: How does this energy fluctuation affect the primary network in the cases of the convertors in fig. 1 (a) and (b)?

The direct-coupled mutator convertor in fig. 1 (a) is without inherent energy reservoir, and operates merely as a switching arrangement. The energy fluctuation of fig. 2 (b) is consequently fully transferred to the primary three-phase network.

Assume in the three-phase network a symmetrical voltage system. The energy fluctuation transferred to the network forces on the three-phase current system non-fundamental components such as subharmonics, harmonics, and a negative-sequence component. This means that the instantaneous secondary reactive volt-amperes are conveyed in the primary AC network by "non-fundamental volt-amperes."†

A convertor with an intermediate DC link, see fig. 1 (b), possesses in the inductance of the DC circuit an energy reservoir between primary and secondary networks. Input mutator and output mutator are themselves without inherent energy reservoirs. Consider, for the sake of simplicity, the special case of ripple-free direct current. The conditions in the DC circuit resulting from this assumption are illustrated in fig. 3. The instantaneous secondary reactive volt-amperes are included in the power pulsation $p=v.i$ which is formed by the fundamental wave i of the secondary current i_c. This power pulsation consists of a steady component and an oscillating component, fig. 3 (c).

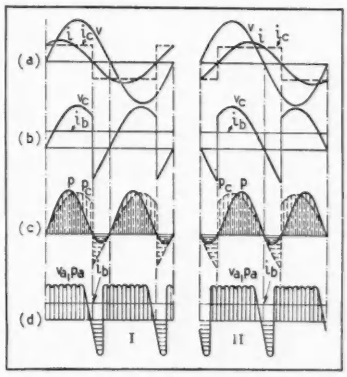


Fig. 3.—Transmission of reactive volt-amperes in the DC circuit of fig 1 (b)

I. Capacitive reactive volt-amperes (natural commutation of the output mutator)
II. Inductive reactive volt-amperes (forced commutation of the output mutator)
(a) AC side of output mutator, (b) DC side of output mutator, (c) instantaneous power passing through output mutator and (d) DC side of input mutator

Analysis of the energy conditions in the DC circuit shows that the oscillatory component of p, and consequently the instantaneous secondary reactive volt-amperes, are balanced out by the inductance and thus do not appear on the primary AC side. This means that the three-phase supply system is not affected by the secondary reactive volt-amperes.

Fig. 3 (d) refers to a special case of operation of the input mutator. The mutator is so controlled that it operates alternately as rectifier and invertor, thus causing an energy fluctuation between the three-phase supply and the inductance. The vertically shaded areas in 3 (d) indicate energy flow from the three-phase supply to the DC circuit, and the horizontally shaded areas energy flow in the reverse direction. This energy fluctuation relieves the inductance of the fluctuation forced upon it by the power pulsations in the secondary network. In other words, part of the secondary power oscillation, and consequently of the secondary reactive volt-amperes, is transferred to the primary AC network. This transfer of power oscillation to the three-phase system is there accompanied by non-fundamental current components.

* See "Frequency Changing With Mercury-Arc Mutators" (R. Feinberg), *Journal of I.E.E.*, 85 (1939), p. 531, and bibliography. (The term "mutator" is here used to denote specific apparatus commonly called a "rectifier.")

† The three-phase reactive volt-amperes which are supplied to the convertor are caused by phase-displacement of the three-phase currents due to the operation of the convertor, and by magnetisation of the convertor transformer; see (2), (18), (19), and (20) of the bibliography cited.

Winding Shop Practice

(*Continued from preceding page*)

Modern practice in copper-built rotors is to cut the slot conductors from round or rectangular strip according to the size of the motor. Rotors for small motors usually have a pressed copper ring at each end of the core punched with holes equal to the number of slots. The bars are then riveted over at each end and brazed or quite often soldered by dipping.

In larger rotors the bars are commonly brazed to a copper ring fitted inside the projecting copper bars. Silver solder is used to some extent as a substitute for brazing. It is more expensive in material cost but much quicker in application. From an electrical standpoint as nearly as possible pure aluminium is required for cast rotors, but to secure good flow of metal it is usual to include a small percentage of silicon.

Very small rotors are usually cast in standard pressure die-casting machines so as to ensure consistent quality at high speed of output, requiring the minimum of finishing and balancing before assembling. Rotors of above about 3-in. diameter cannot be accommodated in pressure-die casting machines, and the molten aluminium is usually poured into the previously heated core. Tunnels in large rotors do not restrict the flow of the metal as they do in smaller rotors and so a high casting pressure is unnecessary.

The machines illustrated in (1), (2) and (4) are by Micafil, Ltd. (Impag, Ltd., British agents), (3) by the Midland Dynamo Co., Ltd., and (5) and (6) by the Automatic Coil Winder & Electrical Equipment Co., Ltd.

Measuring Dielectric Loss

WHAT sort of electrodes should be employed, and how should they be placed in contact with the specimen, for measuring dielectric loss at frequencies of the order of 50 cycles and high voltage stresses?

This question is answered by Mr. E. Bradshaw in the *Journal* of the Royal Technical College, Glasgow. He refers to investigations by E.R.A. and others and to the evidence his own experiments have provided concerning the behaviour of air and liquid films between the electrodes and specimen. Flat plate electrodes are not improved thereby; when used they should be applied to the specimen under considerable mechanical loading and the applied voltage should be below that at which the discontinuity in the power factor/voltage curve occurs.

Tinfoil mounted on rubber discs is not more satisfactory than flat plates, showing that removable, dry, metal surfaces are not very promising. Tinfoil electrodes applied with a trace of oil to act as an adhesive, apart from the time needed to fix them, are probably one of the best means of measuring power factor and permittivity industrially.

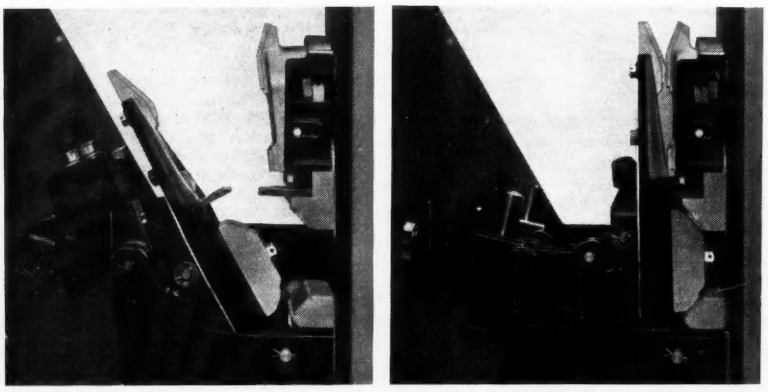
AIR CIRCUIT-BREAKER CONTACTS

Stages in Arc Interruption

By L. B. Hunt, M.Sc., Ph.D.

DURING the past few years air-break circuit-breakers of high interrupting capacity have acquired many of the merits of oil circuit-breakers without the risk of secondary damage by fire in case of failure. Several papers setting out the details of modern designs of air break switchgear have appeared recently* from which it is apparent that provision of adequate breaking capacity, low maintenance costs and continuity of service have received much attention In addition, the requirements of greater safety and minimum size, resulting from the demand for compact metal-enclosed breakers which can be built up into switchboards, have been satisfied.

The development of air circuit-breakers of this type, which will safely and repeatedly interrupt AC up to 40,000 A (RMS) has, of course, involved considerable advances in the design of arcing chambers and contact systems. A great deal of thought has necessarily been given by designers to the problems of arc constriction and magnetic control introduced by the heavy currents which have to be dealt with, always with the requirements of economy of space in the forefront of their considerations. By the development of greatly improved arc-quenching devices very much greater protection of the equipment and of operators has been ensured. But to restrict a breaker of high interrupting capacity to the minimum dimensions has required a complete change of ideas about contact materials and arrangement.



Contact construction in the English Electric 400-V air circuit-breaker, showing "Elkonite"-faced secondary and final arcing contacts in open and closed positions

Not very many years ago low-voltage air circuit-breakers almost invariably employed laminated brush-type copper contacts for current-carrying purposes, with carbon arcing contacts to protect them. The disadvantages of this type of main contact included their large size and their susceptibility to oxidation, with consequent overheating and softening. The first step, therefore, in developing adequate but compact main contacts was to change over to solid copper contact blocks having a facing of fine silver. In this way the advantage is obtained of the low contact resistance of silver and thus of increased current-carrying capacity and comparative easement of maintenance needs. This type of contact will withstand severe overloads without damage, and yet will occupy only a small proportion of the space formerly required by a laminated brush-type contact for equivalent duty.

Arcing Contact Materials

Adequate protection for these main contacts must be provided, but here again the carbon arcing contacts of earlier designs of breakers fall short of modern requirements in respect of size, thermal capacity, contact resistance and liability to fracture. Silver is similarly ruled out on account of its comparatively low melting point and consequent poor resistance to arcing. Also a material of proved ability to withstand the destructive effects of arcing, such as tungsten, fails on account of its tendency to develop oxide films and thus to build up high contact resistance. The resulting voltage drop at the arcing contacts would have serious effects in impeding current transfer on the opening of the main contacts, with consequent damage by burning. An arcing contact material, therefore, had to be sought which would combine low contact resistance with adequate resistance to damage by arcing. Such a combination is provided by the "Elkonite" group of sintered contact materials, and these have consequently been employed as facings for their equipment by several manufacturers of high-breaking-capacity air circuit-breakers.

These materials, as is well known, consist of combinations of a high conductivity metal, such as silver or copper, with a hard and refractory constituent, such as tungsten, tungsten carbide, or molybdenum, prepared by the methods of powder metallurgy. One particular advantage of this production technique, claimed by Mallory Metallurgical Products, Ltd., is that a very extensive range of compositions can be made with varying resistances to arcing and contact resistances.

An interesting example of the possibilities which this flexibility of contact properties imparts is well shown in a recent design of air-break circuit-breaker developed by the English Electric Co., Ltd.† The type for service at 400 V has a three-stage contact arrangement; the first, or main, contact stage serves only to carry the load, and consists of copper blocks carrying silver facings of adequate thickness to ensure long life without constant maintenance. The second stage consists of auxiliary arcing contacts which serve to protect the main contacts from damage during interruption and also to reduce the time interval during which the arcing contacts proper have to deal with the whole of the current, either on making or breaking. The final arcing contacts comprise the third stage.

The material employed for the secondary contacts must be able to withstand a certain amount of arcing, but as their chief object is to protect the main contacts from burning the contact drop of this material must be kept as low as possible. A silver-base "Elkonite" is therefore employed which has only a moderate refractory metal content and so retains minimum contact resistance. At the final arcing contacts voltage drop is not so important with this three-stage arrangement, and an "Elkonite" of high refractory metal content is thus employed to give maximum resistance to arcing, but a contact resistance still sufficiently low not to interfere with rapid current transfer. The actual contact assembly illustrated comprises "Elkonite" plates silver-brazed to the contact blocks, the latter consisting of castings of one of the newer heat-treated copper alloys of superior strength and conductivity in order to reduce the weight of the moving parts and to allow a high mechanical speed of breaking. The upper contacts shown are the final arcing pair, with the secondary contacts below them and the silver-faced copper main contacts at the bottom of the photographs.

In a further design of air breaker for service at up to 3,300 V the English Electric Co., Ltd., has again adopted the three-stage principle, but on account of the increased voltage the system has had to be modified. The silver-faced main contacts are first protected by "Elkonite" arcing contacts, the composition of these again having been chosen to provide the optimum combination of resistance to arcing and low contact drop, but in the third stage the arc is transferred to electrodes which extend the whole length of the arcing chamber. In this way very effective arc extinguishing action is obtained.

* Ludwig and Grissinger, *Trans. Am. Inst. Elec. Eng.*, 1939, Vol. 58, p. 414; Dickinson, *Trans. Am. Inst. Elec. Eng.*, 1939, Vol. 58, p. 421; Seaman, *Trans. Am. Inst. Elec. Eng.*, 1940, Vol. 59, p. 24; Cox and Drucquer, *J. Inst. Elec. Eng.*, 1940, preprint.

† Blandford, *English Electric Journal*, 1940, April, p. 5.

American Electrical Manufacturing

ACCORDING to the *Electrical World*, it was stated at the recent spring conference of the National Electrical Manufacturers' Association that utility orders for distribution equipment were reflecting the uncertainty caused by the Government's action with regard to holding companies. While business for the first four months of 1940 was substantially in excess of that for the corresponding period of 1939, there had since arisen a definite hesitancy. On the other hand, generating and large power equipment was moving along in large volume; one turbine manufacturer reported that he had no capacity available for sixteen months. The N.E.M.A. index for the first quarter showed transmission and distribution equipment orders to be 31 per cent. ahead of a year ago, motors and generators almost 30 per cent., industrial materials 40 per cent. and major appliances (excluding refrigerators) 23 per cent.

HOTEL VANCOUVER

Electrical Plant from Great Britain

By F. H. Fullerton

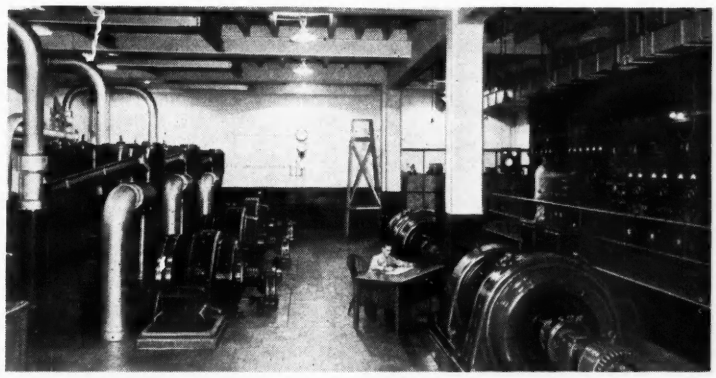
TEN years have elapsed since a start was made on the building of the Hotel Vancouver of the Canadian National Railways in Vancouver, B.C. The work was completed early this year and the original electrical specifications have been considerably modified with a view to keeping abreast of developments in the intervening period. The first intention had been to supply all hotel services from a 220-110-V DC three-wire system from a private power station supplemented by the AC mains of the British Columbia Electric Railway Co. The scheme was finally rearranged to enable the lighting of the hotel to be taken from a 220-110-V, 60-cycle, single-phase distribution system in the building, the DC being applied only to 220-V power services and lifts.

The Hotel Vancouver

Two 400-kW and one 300-kW steam-driven DC generators by Crompton-Parkinson with compounding windings and two 300-kW, 220/2,300-V DC/AC motor generators are installed. The latter were initially intended for converting the AC mains supply, and could still be so used but normally they will run inverted with the compound windings of the DC machines cut out or differentially connected, the rating being reduced by 6 per cent. Voltage regulation on the AC side is taken care of by voltage regulators and frequency control by means of motor-driven rheostats in the shunts of the DC machines operated from relay controlled devices. No special equipment is installed for synchronising the two alternators with one another as they were designed for starting up as motors from the AC side.

Two incoming 2,300-V feeders have their switches interlocked so as to prevent their being closed at the same time. The alternators are parallelled with the system of the power company at the substation of the latter by means of a synchronising panel on which is a plug receptacle for each feeder. A second synchroscope is installed at the power station switchboard in order that the attendant can determine when the hotel system is in parallel with the undertaking's network, and indication is given when either of the high-voltage feeder switches are closed at the substation.

Power transfers in each direction are measured by two totalising AC watt-hour meters in the 2,300-V busbars. Reverse-power relays are installed for tripping the Allen West metal-clad main oil circuit-breakers. The control switchboard is 52 ft. long by 7 ft. 6 in. high. About 75 per cent. of the equipment was designed and constructed in Vancouver, the remainder being of British manufacture. It comprises twenty ebony asbestos panels, six of which are for the motor-generators and three for the DC generators, the remainder being equipped with circuit breakers or fuses for controlling the feeders. The oil circuit-breakers were built locally to the designs of J. G. Statter & Co., Ltd.



General view of engine room showing generators

Transformation of the supply to low voltage is carried out in a vault of the hotel where three 100-kVA, 2,300/220-110-V transformers and three reserve 75-kVA units are installed. Approximately 160 motors ranging in capacity from ¼ to 100 HP are used in the laundry kitchen and various other parts of the hotel as well as a motor-generator for each of the sixteen lifts. In the laundry five motors of from 1 to 3 HP are used for washers and six of from 2½ to 5 HP on tumblers and extractors. There are two telephone systems in the hotel. One serves the guest rooms and is connected with the B.C. telephone circuits; the other is an automatic interdepartmental system of sixty-four instruments. The main switchboard is designed for 1,500 telephones. Every dining room is equipped with a three-channel public address system enabling a speaker to be heard in any other room. Microphone outlets are concealed from view. This system is also connected to all Vancouver broadcasting stations for both reception and transmission.

Each of the 600 bedrooms is wired for radio reception. Although all the receivers are connected to one master antenna, no material interference is noticeable and their wiring is so completely shielded that no noise can be picked up from the operation of motors and generators within the hotel. There are about sixty clocks throughout the building controlled by a master clock with a guaranteed accuracy within three seconds in a month. An alarm warns a trained fire squad to assemble without causing unnecessary alarm to the guests. Should the fire become serious, however, a second and general alarm sounds. Any defect anywhere in the system is automatically indicated on the main panel.

Many novel lighting features have been introduced in the public rooms. For example, the roof-garden dance floor on the fourteenth storey is decorated with lights giving any desired coloured effect of an intensity that can be varied by thyratron tubes.

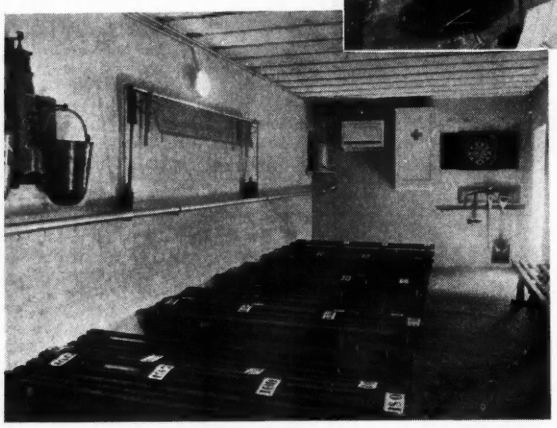
The thyratron-reactor control system involves the use of three principal devices: a small induction voltage regulator or potentiometer, motor operated; a tube panel containing a grid-control rectifying tube (or thyratron), a small half-wave phanotron for completing the rectification started by the thyratron, and a third tube of the high-vacuum, full-wave rectifying type which acts as an automatic voltage-regulator; and a saturable reactor. As the thyratron is a three-element rectifying tube, its output, combined with the output of its associated phanotron, furnishes full-wave rectified current which is always under the control of the grid of the thyratron. The voltage on the grid varies as the induction regulator is manipulated through the medium of the full-wave rectifying tube.

As the heavy currents required by a large number of lamps cannot be carried directly by small tubes, a high efficiency saturable reactor with two windings, one for AC and one for DC, is interposed between the tubes and the lighting circuit. These windings are so arranged that full transformer action is prevented. The AC winding is in series with the lighting circuit and carries the load current, the amount of which is determined by the reactance of the circuit. Each bedroom is equipped with a special call device which registers on an indicating panel with 600 miniature lights in the housekeeper's office. Mr. R. H. Williams was chief engineer for the electrical contractors, Hume & Rumble, Ltd.; Mr. C. H. Borton superintendent and Mr. W. G. Daley construction foreman. The latter has since been appointed as chief electrician in the hotel. The entire electrical insulation was supervised by Mr. N. S. B. Watson, of the Canadian National Railways.

FACTORY A.R.P. SCHEME

Comprehensive Arrangements

AN A.R.P. scheme recently completed by John Ismay & Sons, Ltd., at their lamp works might well be described as the last word in completeness and efficiency. Apparently nothing has been overlooked in providing adequate attention for the employees engaged there. Every one of them has a numbered place allocated in one of seven substantially built brick shelters. Accommodating from 50 to 120 persons, each of these is completely self-contained and is fully equipped with collapsible stretchers, first-aid appliances, breaking-out gear, a laid-on-hot water supply, an independent drinking water tank, lavatory accommodation, fire fighting equipment, independent lighting, hand lamps, intercommunication telephones to control and complete wardens' equipment housed in a separate cupboard, not to mention a dart board. Gas-proof steel doors are provided, and ventilators can be quickly sealed in the event of a gas alarm. A power plug is also available for heating.



Left: One of the smaller shelters at John Ismay & Sons' factory. Above: "Lido" on top of two other shelters

A fully trained fire brigade of twelve men has all the latest fire fighting appliances at its disposal and should the main water supply fail a 10-HP pump can be brought into service to supply water from an adjoining river. The first-aid personnel comprises ten stretcher bearers, ten trained women for the first-aid rooms and forty other trained men and women distributed throughout the shelters. Actually, sixty members of the staff have gained their St. John first-aid certificates and no fewer than 540 have qualified for general public A.R.P. certificates. The first-aid rooms are divided into two parts, one for bed cases and the other for "sitting cases." Separate exits to ambulances are provided in both the "bed case" room and the stretcher parties' room. Kit for the demolition squad of twelve men includes oxy-acetylene cutting plant, two large jacks, wheelbarrows, tarpaulins, ropes, &c.

The decontamination centre, which is a short distance away from the shelters, has undressing rooms for both sexes, complete with bins for clothing, &c. These rooms are reached through a double door air lock, a further air lock connecting them with the decontamination room proper, which is equipped with showers, eye douches, &c. An adequate supply of spare clothing, blankets, &c., is kept in the very extensive stores and any casualties are again transferred direct from here into ambulances. A thermostatically controlled hot water supply is provided from a 100-gal. tank, fully protected from blast and splinters. Throughout the whole scheme the A.R.P. lights have been arranged on separate circuits, so enabling the remainder of the factory lights to be switched off without interference. Mr. M. Browne, who is in charge of the A.R.P. scheme, tells us that practices are held about once a week, and that it is possible to get every member of the staff under cover within three minutes, a system of checking enabling any missing person to be rapidly "rounded up." Every shelter has its own warden and messenger.

Mr. Z. Deshaw, the general manager, is justly proud of the whole scheme for which he was responsible and, incidentally, it adds further to the amenities provided for the employees, a "sun lido" complete with gaily coloured sunshades having been built over the two largest shelters. Referring to another matter of great importance at present, Mr. G. B. Mansell, the sales manager, tells us that over £200 worth of National Savings Certificates were purchased by employees last week under a scheme for which Mr. J. Galley is responsible.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Mutual Aid in Sussex

AT the request of Mr. H. Dixon, M.I.E.E., engineer and manager of the Central Sussex Electricity, Ltd., I am writing to advise you that at a meeting of the engineers of various Sussex electricity supply undertakings, held on June 11th, at which he presided, a group was formed to give mutual assistance in the way of skilled labour, loan of spare plant and materials, transport, &c., in the event of major damage to mains and plant caused through enemy action or sabotage.

The meeting was called by the writer, and the following engineers attended:—Mr. H. Dixon (Central Sussex); Mr. F. Ffrench (Horsham); Messrs. J. B. Morgan and Dobson (East Grinstead); Mr. Whittle (Lewes); and Mr. J. McAlister (Southern Areas).

Mr. Dixon thinks that under present circumstances the formation of similar groups is a matter to be encouraged, and that you may deem it of sufficient importance to give it publicity in your journal.

SUSSEX ELECTRICITY SUPPLY CO., LTD.
F. A. AVERY,
Crawley, *June 13th.* *Engineer and Manager.*

A Fuel Overseer's Questionnaire

I saw in a Nottingham paper last week a paragraph which has puzzled me somewhat. It was to the effect that the Local Fuel Overseer had asked householders to make a declaration listing the apparatus on their premises—cookers, water heaters, kettles, fires, irons and vacuum cleaners—at the same time indicating which appliances were in use and stating the rateable value of their houses. The avowed purpose was to enable the Fuel Overseer to "assess the amount of electricity available for domestic use under the Fuel and Lighting Order."

I cannot find anything in the Fuel and Lighting Order regarding such a questionnaire; the only basis for the assessment of allowable quantities seems to be the corresponding quarter of the year 1938-39. However that may be the idea is not a bad one in more normal times than these. In the past the ELECTRICAL REVIEW itself has advocated that periodical inspections should be made to ascertain what apparatus is in possession of consumers, thus enabling the electricity supply undertaking to gain an idea of the possible domestic demand as well as keep appliances in commission.

Presumably the Nottingham undertaking will be given access to the returns, and perhaps this is a scheme which other Fuel Overseers might copy. NOTTS.

June 17th.

Electric Gas Lighter

May I crave the hospitality of your correspondence column to seek information from some of the older readers as to where it is possible to obtain supplies of an early make of gas lighter which was very efficient and had an indefinite life? It was about 16 in. long, with a small magneto housed in the base, with geared push-button control. The spark was, of course, at platinum points. It would surely have a ready sale and be a little addition to the electrical retailer's turnover. R. J. SCARBOROUGH

(Scarborough, Mitchell & Co., Ltd.).

North Finchley, *June 17th.*

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

ON Monday, **Mr. Frank Pick,** until recently vice-chairman of the London Passenger Transport Board, commenced a tour of British ports to report to the Minister of Transport on the organisation set up to secure speedy discharge of clearance of goods so as to ensure that any exceptional demands likely to be made on the ports will be met.

Professor W. L. Bragg has been elected president of the Institute of Physics to take office on October 1st.

Mr. W. E. Crawley, who is well known to Ferranti customers in London, was presented last week by the directors with a piece of plate in appreciation of 48 years of valued service, having attained the retiring age of 65. The presentation was made by the deputy chairman, Mr. Arthur Whittaker, supported by Mr. Denis Z. de Ferranti. Mr. Crawley joined the staff of Dr. Ferranti at Charterhouse Square. He will remain in harness until after the war is over.

Mr. W. E. Crawley

No other nominations having been received, **Mr. H. J. Allcock,** M.Sc., has been elected chairman of the Transmission Section of the Institution of Electrical Engineers for the 1940-41 session.

Mr. W. A. Tookey, M.Inst., C.E., M.I.Mech.E., M.I.A.E., consulting engineer, has removed to 83, Cumberland Road, Bromley, Kent (telephone: Ravensbourne 0773).

Mr. W. A. Moore's retirement from the position of joint advertising manager of W. T. Henley's Telegraph Works Co., Ltd., was recently announced in these columns. On Friday last week a number of Mr. Moore's friends in Fleet Street gathered at the Rainbowe Tavern and presented him with a gold cigarette case and, as a few subscriptions to the presentation came in late, a cheque for the balance. **Mr. T. C. Elder,** who presented these tokens of good will, paid a tribute, endorsed by all present, to Mr. Moore's unfailing courtesy and generosity.

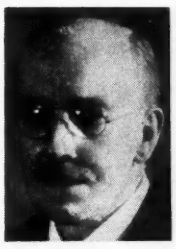
Mr. Peter F. Bennett, Director-General of Tanks and Transport in the Ministry of Supply, has resigned and **Mr. G. Burton,** managing director of the Birmingham Small Arms Co., Ltd., has been appointed to succeed him.

Mr. John Guiterman, representative of S. Guiterman & Co., Ltd., has been married to Miss Betty Winsor, of Old Windsor.

In recognition of his services as chief electrical engineer to the Tonbridge Urban District Council, **Mr. S. J. Ellis,** who has just been appointed city electrical engineer of Canterbury, was recently presented with an inscribed briefcase. The presentation was made by Councillor R. Norton, chairman of the Electricity Committee.

Mr. Henry George Nelson, only son of Mr. G. H. Nelson, chairman and managing director of the English Electric Co., Ltd., was married on June 8th at St. Mary's, Cadogan Street, London, to Miss Pamela Bird, younger daughter of the late Mr. E. Roy Bird, M.P., and Mrs. Roy Bird.

Bolton Corporation Lighting Committee has accepted the resignation of **Mr. H. Hamer,** lighting superintendent, to take effect on July 7th. Applications are to be invited for the position at a salary of £350 a year, rising by annual increments of £25 to £400, plus war bonus and a motor-car allowance (£36 a year).



Mr. G. H. Nisbett

Acting on medical advice, **Mr. G. H. Nisbett** has relinquished his duties as managing director of British Insulated Cables, Ltd., but will continue to act as deputy-chairman of the company, which he has served as an executive officer for forty-six years. **Mr. T. H. Martin-Harvey** and **Mr. W. Travis** have been appointed joint managing directors.

Mr. E. W. Steele, M.I.E.E., has been appointed works manager of the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd.

Mr. T. H. Carr, A.M.I.E.E., A.M.I.Mech.E., M.A.Min.E.E., for the past two years technical assistant to the borough electrical engineer of Derby, has been appointed power station superintendent there. Before going to Derby he was chief assistant constructional engineer in the Sheffield Corporation Electricity Department. Mr. Carr received his engineering training with John Spencer & Sons, Ltd., and Sir W. G. Armstrong-Whitworth & Co., Ltd., and subsequently held appointments with A. Reyrolle and Co., Ltd., Merz and McLellan, the North-Eastern Electric Supply Co., Ltd., and the National Boiler & General Insurance Co., Ltd.

Mr. T. H. Carr

Obituary

Killed in Action.—We regret to report that **2nd Lt. Piers Richard Edgcumbe,** the only son of Lt.-Col. Kenelm Edgcumbe, managing director of Everett, Edgcumbe & Co., Ltd., has been killed in action.

Mr. A. C. Coward, assistant mains engineer with Swansea Corporation Electricity Dept., died recently. He had been employed by the Corporation since 1904.

Mr. J. H. Preston.—We regret to report the death of Mr. John Henry Preston, a director of Preston and Thomas, Ltd., Cardiff.

Will.—Mr. Robert Beattie, emeritus professor of electrotechnics at Manchester University, left net estate valued at £5,878.

Reserved Occupations

Extracts from Revised Schedule

THE revised Schedule of Reserved Occupations is now obtainable from the Stationery Office (or through booksellers) at the price of 1s. net. It is a very comprehensive publication, and we reproduce from it a number of the principal classes of workers in the electrical industry.

Professional electrical engineers are "reserved" from the age of 25, but they may be accepted at any age for any of the National Defence services in any scientific or professional capacity for which they are fitted. Graduates and students under the age of 25 are dealt with by University Joint Recruiting Boards or technical committees associated with these Boards.

Supply Industry

So far as the electricity supply industry is concerned, the ages of reservation are as follows:—Engineer, assistant engineer (combustion, control, district, generation, mains development, mains (transmission and/or distribution), relay, resident, shift charge, steam, substation), junior engineer, technical assistant (25). Steam turbine drivers (18, or 23 for service in trade capacity). Stationary engine driver, water turbine driver (23). Consumers' engineer (30). Superintendent, assistant superintendent (boiler-house, mains, meter and testing, power station, substation) (25). Domestic appliance maintenance superintendent (30). Chief technical officer (meters) (25). Inspector, assistant inspector (installation, meter, substation), mains foreman (25). Auxiliary plant attendant (30). Meter fixer (30). Meter tester (25). Substation attendant, assistant substation attendant (25). Switchboard attendant, control room attendant (25). Electricity undertakings' (administrative, professional and clerical) staffs not specifically reserved at a lower age (30).

Electricians

The following are included under the heading "Electrician, wireman, &c.":—Foreman, charge hand (age appropriate to the occupation corresponding to his practical experience as a tradesman). Electrician, wireman (general hand); cable jointer, repairer (h.v. cables); cable jointer (excluding h.v. but including telephone and telegraph cables); electrician (cinematograph), sound engineer; electrician (theatre), electrician (film studio); electrician, wireman (vehicle and aircraft); overhead linesman (not tramway or trolley-bus), linesman; overhead wireman (railway, tramway, trolley-bus); tester; telephone, telegraph fitter, mechanic (18, or 25 for service in trade capacity). Electrician (ship), ship's wireman (18, or 21). Cable layer, service layer (electricity); conduit railman (25).

Lamps and Cables

In the electric lamp and radio valve industry the following are specified:—Foreman, charge hand; lamp assembler, valve assembler; stem or foot maker, tubulator, piecer, pinching machine operator; filament winder, filament maker; filament mounter, grid mounter; exhauster pump attendant, sealer-off; examiner (all 21). The following are included under the heading "Electric cable maker, wire rope maker":—Foreman, charge hand; cable machine driver (including tinning, stranding, slitting, insulating, calender, spreading, armouring, laying-up, lead press, lacquering machine driver); strander, spinner (wire cable or rope); splicer (wire rope); winder (machine); armourer; braider, paper lapper, taper (machine); lapper (hand); compound maker, tanker; bitumen coverer; pump driver, melting pot assistant, flaker-on; impregnating pump driver, vacuum pump driver; tester (wire rope, electric cable), test attendant (electric cable) (all 21).

Communications

The heading "Electrical communication and signalling systems" includes the following:—Foreman, charge hand (age appropriate to the occupation corresponding to his practical experience as a tradesman). Wirer (wireman); installer; instrument adjuster; system inspector; tester, cables (telecommunication services); maintenance hands, telephone and telegraph apparatus; automatic and manual telephone exchange,

teleprinter telegraph apparatus, voice-frequency telegraph equipment, telephone repeater apparatus, wireless transmitting and receiving equipment (including radio interference detection apparatus), (all 18, or 23 for service in trade capacity). Cable former, cable form maker (18, or 21). Quartz crystal worker; cable engineer, probationer cable engineer (telecommunication services) (18). Rigger (wireless masts) (30).

Under the classification "Fitter, erector, &c. (electrical engineering)" the following are included:—Foreman, charge hand (age appropriate to the occupation corresponding to his practical experience as a tradesman). Electrical fitter (general hand); electrical machinery erector; maintenance electrician, electrical engineer (maintenance); controller maker, heavy switchgear maker, rheostat builder; magneto maker, assembler; switchboard maker, erector; transformer builder, fitter; tester, inspector (all 18, or 23 for service in trade capacity). Armature builder, commutator builder, core builder; armature winder, heavy coil winder (18). Other workers not specified above (23).

Among other classifications of an electrical nature are the following:—Accumulator maker, battery maker—Foreman, charge hand; lead paster, plate former; accumulator maker (all 25). Arc welding electrode manufacture—Foreman, charge hand; coat blender; machine feeder, operator; process inspector (all 25). Carbon and carbon goods (including brushes and crucibles) manufacture. All workers in occupations not otherwise specifically reserved (other than labourers) in productive processes (30). Fitter-assembler (electrical engineering) (18, or 25). Cable hand (cable ship) (18). Electrically propelled goods vehicle driver (excluding truck driver): vehicles exceeding 2½ tons unladen weight (25), vehicles 1½ to 2½ tons (30). Electrical instrument maker (18, or 23). Electric fire, cooker, refrigerator assembler, maker; radiator (heating) assembler; repairer (stove, refrigerator, &c.) (25 until August 1st; 30 thereafter). Wireless engineer, mechanic, &c.—Foreman, charge hand (age appropriate to the occupation corresponding to his practical experience as a tradesman). Wireless engineer; fault finder, tester; wireless repairer, wireless mechanic, service man (wireless) (all 18, or 30). Loudspeaker cone maker (30).

New Zealand Centennial Exhibition

Lavish Lighting Display

ONE of the principal features of the New Zealand Centennial Exhibition held in Wellington was the ambitious scheme of illuminations. The task facing the advisory electrical committee was to provide a colourful spectacle and adequate illumination over an area covering about 60 acres and including 16 acres of buildings having nearly a mile of frontage, for which purpose 1,000 kW was available. Totally indirect lighting was prescribed, except for fluorescent discharge tubing for accentuating architectural features and exposed low wattage lamps for animation.

Exterior illuminations at the New Zealand Centennial Exhibition carried out by the British General Electric Co., Ltd.

The preparation of the lighting scheme and specification occupied ten months, and on its completion the whole contract—by far the largest ever placed in New Zealand—was awarded to the G.E.C.'s branch company, the British General Electric Co., Ltd., of Wellington. G.E.C. material was used throughout and the amount of work involved is indicated by some of the principal items: 11,000 "Osram" lamps ranging from 15 to 1,500 W and including colour-sprayed lamps up to 750 W; 280 "Osira" electric-discharge lamps; nearly a mile of fluorescent tubing; 200 floodlights and 100 "Gecoray" reflectors; 74,000 yards of Pirelli-General t.r.s. cable (in sizes varying from 1/0.044 in. to 37/0.083 in.); 11,000 lampholders; 10,000 fixing clips; 7,500 yards of adhesive tape; 6,000 connectors; 2,000 line taps; and 2,000 fuses.

Throughout Centennial Avenue 58 floodlights with 100-W sodium lamps illuminated the buildings on either side and also the entrance at the rear of the Tower. The two broad avenues on each side of the entrance gates contained the Australian and British Pavilions, which were floodlighted in deep green from fifty projectors containing 250-W discharge lamps. At the entrances to the buildings from each avenue the cool tone was relieved by light from gold-coloured fluorescent tubing and amber lamps.

Centennial Tower, 160 ft. high, dominated the Exhibition grounds. As seen from the main entrance, it was illuminated in red with three vertical lines of neon tubing concealed behind metal shields, while the sides were floodlighted by twelve 1,500-W amber reflectors. At the lower part of the structure colour changing was provided by about 160 colour-sprayed lamps; a mural frieze on the base was illuminated in white by concealed fluorescent tubing.

In the Courts of Progress and Pioneers on each side of Centennial Avenue the building frontages were floodlighted in blue by means of 72 electric-discharge units. Each court terminated in a large "sound shell" which in addition to acting as an efficient bandstand had a striking appearance. The sound shells were framed by fluted towers, volutes and trumpet columns. In each shell the five fins formed a self-contained three-colour changing unit.

Ten of the twelve entrances to the buildings from the principal avenues were treated with concealed lighting and colour changing on architectural features such as coves and trumpets. On the fluted columns at the entrance to the Government Court and the General Exhibits Building and also beneath the verandahs and on horizontal ridge coves at the various building entrances, gold-coloured fluorescent tubing was used.

The general lighting of the avenues and gardens was carried out by 28 single pylons 25 ft. high and eight double pylons 30 ft. high; these provided totally indirect lighting, the load being about 160 kW. A combination of tungsten filament and mercury discharge lighting was employed. Among the most attractive features of the grounds were four reflection pools, which were bordered by 30 decorative lighting standards topped by double-tier trumpets.

The colour-changing was effected by motor-driven Rimmers which handled a load of nearly 500 kW. T.r.s. cable and wedge-type lampholders (where the lamps were not contained in metal reflectors) were used almost exclusively. The installation work was carried out by James Gibson & Son, Wellington.

Though the various exhibition buildings presented many features of interest, the open timber roofs in most cases were not favourable to good lighting. In Government Court, however, which occupied an area of 100,000 sq. ft. and contained more than 30 pavilions, the ceiling was covered in to give a three-tier effect, and a complete lighting scheme designed by the B.G.E. was adopted; the company was also responsible for the lighting of the various pavilions. The ceiling was illuminated by 4,000 ft. of concealed discharge tubing in three colours, while the general lighting was from 175 "Gecoray" reflectors mounted behind louvres. A small cinema seating 200 people was lighted entirely by fluorescent tubing. The installation work was carried out by C. H. Oxley & Co., Wellington.

The B.G.E. stand was a conspicuous feature of one of the main buildings, occupying a space of 600 sq. ft. The latest developments in modern lighting technique were displayed.

Long-service Cables

BATH was one of the first towns in Europe to have house and street lighting by electricity, a supply for arc lighting being given in 1888. The early cables for house lighting were two single-core vulcanised bitumen 2,250-V, laid in iron troughs filled with bitumen, and each house supplied had its own transformer, the internal wiring being arranged for 110 V. The Callender solid system was adapted, and since Callender cables have been used continuously.

Excavating a cable laid solid in Bath over forty years ago. The foreman (in dark overcoat) was employed by Callender's when the cable was laid

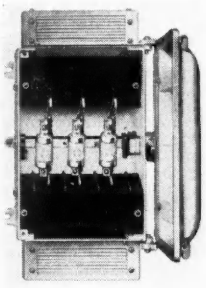
Developments have occasioned the removal of some of the early cable, after over forty years of service, and it has been replaced by 6,600-V armoured cable. Mr. G. F. Perry, the present cable foreman, was actually employed by Callender's in 1897 in laying the cables which he has now been called upon to remove, having been employed by Bath Corporation Electricity Department since leaving Callender's after the early mains were laid.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

H.R.C. Fuse Switches

A NEW range of h.r.c. fuse switches made by BILL SWITCHGEAR, LTD., Aston Lane, Perry Barr, Birmingham, is a development of the Bill "Super K" switch fuse, the difference being that the use of English Electric h.r.c. cartridges located over the switch blades, gives a considerably shorter unit.



Bill triple-pole h.r.c. fuse switch with standard end-boxes

A heavy cast-iron case gives a rigid foundation for the switch movement, while the cover is hinged to facilitate wiring and fuse replacement. The switch action is interlocked and the contacts are mounted on bakelite. The mounting of the brushes on bakelite avoids breakdown to earth and the "M" type contact clips give a strong pressure contact. The quick make and break action has a rotary movement with a simultaneous make and break on both poles.

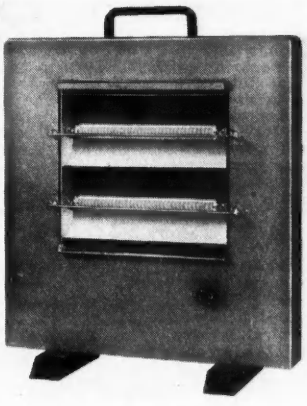
Detachable end-boxes give ample wiring room and the design is such that the cables are brought straight in and out, or under the switch movement, if required. The switch is readily adaptable for busbar chamber mounting and there is a complete range of cable glands for special cable. The units are available for 30, 60, 200, 300 and 500A, in double, triple and four pole, and with neutral link.

Laboratory Apparatus

New developments by GRIFFIN & TATLOCK, LTD., Kemble Street, Kingsway, W.C.2, include the weightless "Microid" lever balance, which is claimed to indicate weights up to 200 gm. with an accuracy of 0.5 gm. within 6 sec., and the "G.L.C." apparatus (a modification of the Bone and Wheeler system) for rapid constant-volume analysis of almost any gaseous mixture. Other recent introductions are the "Microid" gas generator for pressures up to 18 cm. w.g., for replacing the Kipp's apparatus previously imported from Germany, and sintered glassware.

New Electric Fires

The introduction of several new portable fires is announced by ELECTROWAY HEATERS, LTD., Sparrow Hill, Loughborough. A realistic imitation coal fire



Electroway model "84" fire

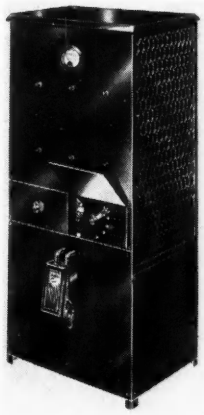
effect is provided in two of the models one of which has two 1-kW tubular bars each in a chromium plated brass reflector, while the other has two 1- or 1½-kW tubular elements fitted in a single deep parabolic reflector.

The neat model "84" unit with two 1-kW reflector elements will harmonise with any modern scheme of decoration, while high radiant efficiency, convenient portability and great durability are combined in the elegant model "94." Handsome appearance and effectiveness also go together in two portable screen fires, the design of which is simple yet decorative.

A range of hotel fires incorporating prepayment meters is also available. All the models mentioned have welded steel bodies, which can be supplied in a number of pleasing finishes.

Charger for Battery Vehicles

Recharging batteries of varying voltage and capacity often provides a problem for electric vehicle manufacturers and distributors handling different sizes of electric vehicles, trucks and hand-barrows. A new charger produced by the WESTINGHOUSE BRAKE & SIGNAL CO., LTD., Pew Hill House, Chippenham, has a maximum charging rate of 30 A, with a normal taper and provision for adjusting the current between 30 and 10 A by the use of ballast chokes and tapping the mains transformer. Its charging capacity is from one 12-V car starter battery up to an electric vehicle battery consisting of 44 lead cells, or the equivalent in alkaline cells. Up to forty-two 6-V car starter batteries may be handled at a time with a charging rate of 10 A. It is not, however, possible to charge both vehicle and car starter batteries at the same time, but providing the total number of cells is within the limits of the charger, two or more vehicle batteries of the same type and capacity may be dealt with simultaneously.



Westinghouse vehicle battery charger

The equipment consists of five banks of full-wave rectifiers permanently connected in series, each bank being fed from a separate secondary winding on the mains transformer, with ballasting on the AC side. Voltage control is by means of two selector links, the first—a simple two-position link—being used to give "high" and "low" positions, while the second, a five-way selector, is employed to pick off the bank, or banks, of rectifiers sufficient for the battery on charge.

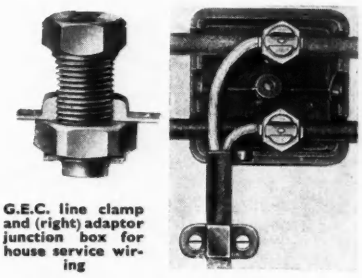
When in the "low" position the first bank of rectifiers, which has an output sufficient to charge a 24-cell battery, is cut out of circuit, and batteries of 6, 12, 18 and 21 cells may be charged according to the position of the five-way link. In the "high" position, the first bank of rectifiers is brought into circuit, and batteries of 24, 30, 36, 42 and 44 cells may be charged.

Wiring Accessories

A line clamp and an insulating shroud have been recently added to the range of accessories designed by the GENERAL ELECTRIC CO., LTD., for use with overhead transmission lines. The clamp is intended for use in a service tap-off and for junction box connections, as well as for an all-insulated connection in conjunction with the new insulating shroud. It is in two parts only. The gripping pad cannot be dropped away from the nut, while locking tabs prevent loosening due to vibration. A wedge-shaped end guides the nut easily into position.

The two sizes available are suitable for main conductors from 0.02 to 0.060 sq. in., and from 0.060 to 0.10 sq. in. respectively, each size being suitable for service conductors from 0.002 to 0.060 sq. in. The insulating shroud is of light bakelite construction.

Among recent additions to the range of components available for house service



G.E.C. line clamp and (right) adaptor junction box for house service wiring

wiring is a "Wittonite" junction box. This adaptable device will accommodate cables for straight through, angle, terminal or dummy positions in the house service overhead wiring system, thus obviating the necessity for stocking different patterns. The unit will take single or twin conductors, knockout webs being provided so that the outlets not required remain sealed. Connections are made by means of the clamps described above.

Industrial Lighting Units

The present conditions in industry, which demand efficient lighting for increasing production together with safety of the operator, will render particularly welcome the announcement that the MIDLAND ELECTRIC MANUFACTURING CO., LTD., has just introduced a new range of "Memlo" low-voltage transformer units and "Memlite" adjustable lamp fittings.

"Memlite" heavy industrial pattern fitting and (left) "Memlo" l.v. transformer unit with cover removed

The transformer unit comprises a double-pole switch fuse, a double-wound transformer, and cartridge fuses for the secondary circuit. Even when the cover is removed it is impossible inadvertently to obtain a high-voltage shock, since all high-voltage conductors are inaccessible. Three standard models are available to step down from 230-250 to 12 or 25 V, 400-440 to 12 or 25 V, and 400-440 to 25 or 50 V. The output available at low voltage is 50 watts in all models at either voltage. The unit is enclosed in a neat, black, stove-enamelled cast-iron case arranged for conduit.

The "Memlite" fittings are made in eight models, for use on low voltage or direct from the mains. Two and three arm types can be supplied in both light and heavy industrial patterns, while three different forms of base fixtures permit direct mounting to a "Memlo" unit as on machine tools, etc.; conduit attachment as on benches, etc.; or for use as a portable on test and assembly benches, etc.

Square section steel tube of ample dimension is employed in the construction, all joints being of specially high-quality rust-resisting steel. The spun steel vitreous enamelled shades are supported independently of the lampholder.

COMMERCIAL and INDUSTRIAL NEWS

National Savings Schemes. Exports to the Mediterranean. Safety in Factories

Copper Supplies

FOR the first time since the outbreak of war the British Government has made inquiries for a large quantity of copper in the United States. *The Times* states that the tonnage involved is about 25,000 and the price to be paid is likely to be about £64 per long ton, compared with not much more than £50 paid by the Ministry of Supply to Empire producers. There has been much speculation whether this deal represents an isolated transaction with the objective of raising our emergency stocks without delay, or whether further large purchases will follow.

The British Empire is self-sufficient and, in fact, more than self-sufficient in copper in this war. While the Empire's copper output was less than 100,000 tons in the World War, Northern Rhodesia and Canada alone are now in a position to supply together between 600,000 and 700,000 tons. In peace-time United Kingdom copper requirements are about 300,000 tons per annum. Naturally war requirements are much higher, although it must be kept in mind that civilian consumption has been curtailed. The one difficulty arising, however, is that the Empire's copper-refinery capacity is not large enough to treat the Empire supplies of concentrates to the full, and it may well prove necessary to have certain quantities of Empire copper refined in the United States.

Timber Control

The Minister of Supply has appointed a Timber Control Board which, subject to him, will be responsible for all questions relating to timber supplies and production. The chairman of the Board is Mr. George Dallas, the other members being Major A. I. Harris, the Timber Controller, and Sir Roy Robinson (chairman of the Forestry Commission). A representative of the Mines Department will be added for the consideration of any question relating to mining timber.

Fan Export Group

The Fans and Ancillary Equipment Export Group has been formally registered by the Board of Trade. The chairman is Mr. W. A. Davidson and the secretary Mr. A. G. Marshall, whose offices are at 2, Howard Street, Strand, London, W.C.2.

E.T.U. and "Dilution"

The *Electrical Trades Journal* states that the Electrical Trades Union has arrived at an agreement for the temporary relaxation of existing customs as to the employment of skilled electricians to meet wartime conditions. This has become necessary on account of the Union's inability to meet the increasing demands for electricians in shipbuilding and ship-repair work. Where "dilutees" are employed it has been arranged that a record shall be kept, in order to conserve the positions of men whose jobs are taken over by less skilled men.

Control of Supply Companies

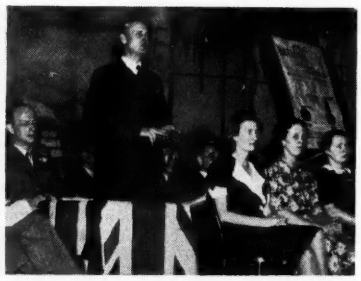
The Minister of Transport has made an Order under Section 55 (4) of the Defence (General) Regulations, 1939, authorising the Electricity Commissioners to carry on the following undertakings in accordance with his instructions: The Lincolnshire and Central Electric Supply Co., Ltd.; the Mid-Lincolnshire Electric Supply Co., Ltd.; the Altrincham Electric Supply, Ltd.; the Windermere & District Electricity Supply Co., Ltd.; the Keswick Electric Light Co., Ltd.; the Campbeltown & Mid-Argyll Electric Supply Co., Ltd.; the Thurso & District Electric Supply Co., Ltd.; and Public Utilities (Electric), Ltd.

The first-named company was registered in 1930 as British & International Utilities, Ltd., and its name was changed to the present style in 1935, when it became a public company. It has an authorised capital of £750,000, the whole of which is issued, and it owns or controls all the other companies covered by the Order. The chairman is G. Volpi Conte di Misurata and the general manager Count C. Cicogna. Out of the £500,000 of ordinary capital £496,499 is held by a Newfoundland company, the European Electric Management Corporation, Ltd.

The Electricity Commissioners have appointed Mr. Andrew Black, of the firm of Thomson McLintock & Co., accountants, as controller of these companies.

Savings Schemes

The Witton group of the General Electric Co.'s factories was among the first in the country to respond wholeheartedly to the Government's urgent appeal for support in the National Savings movement. A savings group was in active operation early in December last, and at the end of that month one in every ten of the company's employees had joined the scheme. The National Savings Week led the company to launch a special drive, and a personal appeal was made to every employee. The directors further stimulated the effort by presenting 100



Mr. W. Newcomb Cryer, West Midland Region Commissioner of the National Savings Committee, addressing the meeting before the ballot at the Magnet Club began. Mr. J. J. Gracie, Chairman of the G.E.C. National Savings Group at Witton and a member of the Executive Savings Committee, is seated on his right

certificates in units of 10, 5, 2 and 1, to be distributed by ballot, each person having one chance for every certificate held or in course of purchase. The response to the appeal was overwhelming. Over 15,000 certificates have been taken up, and every other employee is now a subscriber to National Savings Certificates. The average contribution per head per week, based on the total works personnel of nearly 10,000, has reached 2s. 10d., while over £600 is raised each week by voluntary wage deductions. In addition, the cash purchases of certificates now represent a sum of more than £8,000.

Within ten days of the inauguration recently of a National Savings Provident Scheme, 95 per cent. of the employees of the E.M.B. Co., Ltd., had agreed to participate. Subscriptions of 6d. to 4/- are deducted from their pay each week to buy National Savings Certificates, the company guaranteeing that, if a member dies, his savings will be made up to an agreed figure depending on the amount of the weekly subscription. The scheme is managed by a committee of members nominated by the company and elected by the employees.

The Bradford Case

The report and recommendations of the special committee set up to inquire into certain matters concerning the Bradford Electricity Department (*vide* our last issue, p. 643) came before the Council on June 11th. During the discussion the chairman of the committee of inquiry said that the committee's view was that in future the electrical engineer should be kept entirely separate from the business administration side.

Alderman J. W. Longley, chairman of the Electricity Committee, complained that although it was not the duty of the committee of inquiry to consider whether or not an offence had been committed, a very large part of the report seemed to attempt to establish justification for the prosecution. He opposed the committee's dictum that Mr. Allsop was not suited to his position as commercial manager, stating that Mr. Allsop had done extremely good work during his thirty years with the Department. Again, Mr. Rhodes was condemned for serious misconduct although he had been found "Not guilty" at the trial. Other speakers supported this view, but there were also members who thought that the recommendations did not go far enough. The committee's report was accepted. Alderman Longley said that there would be difficulties in connection with the appointment of a manager. The Lord Mayor replied that there was nothing to prevent the Electricity Committee from considering the recommendations.

Ald. Longley stated after a meeting of the Electricity Committee on June 17th that the Committee had given instructions for the recommendations to be carried out.

Exports to the Mediterranean

The Board of Trade has made an Export Control Order, with effect from June 13th, under which the export of all classes of goods to Bulgaria, Greece, Hungary, Liechtenstein, Rumania, Switzerland, Yugoslavia and the Black Sea ports of the U.S.S.R. is prohibited except under Board of Trade licence. This step has been taken as a result of Italy's entry into the war in order to enable the necessary control to be exercised over exports to the Mediterranean and adjacent areas. It is not, however, to be regarded in any sense as a decision to discontinue trade with neutral countries in those areas.

Company Fined

As a sequel to a fatal accident on April 1st, when a workman was killed while changing a lamp bulb, the Northern Aluminium Co., Ltd., was fined £40 last Friday at Birmingham Police Court. The company was fined £35 for having the screw cap of an electric lamp not covered with insulating material and £5 in respect of a defect in the wiring system.

Work for the Wounded

Major the Hon. J. J. Astor, proprietor of *The Times*, Admiral of the Fleet Sir Henry Oliver, General Walter Braithwaite and Air Vice-Marshal C. A. H. Longcroft are signatories to an appeal to employers on behalf of the National Association for Employment of Regular Sailors, Soldiers and Airmen.

The appeal points out that soon there will be men whose disabilities will prevent further active service and that many of them will be capable of and anxious for work to help the national effort. The possibility is foreseen that the transference of able-bodied men to more arduous work may release posts for discharged men and employers are asked to consider how this might be applied in their own works and offices. It is to be the special duty of the staff of the Association to discover the capacity for work of those whose war service has impaired their former skill and to guide the men into the industries in which they can be of the greatest use. The address of the Association is 14, Howick Place, London, S.W.1.

Factory Safety

"A lost-time accident in a factory should be regarded as much a gain to the enemy as a casualty in the armed forces." This striking statement, made by Lord McGowan, chairman of Imperial Chemical Industries, Ltd., in his presidential address to the National Safety First Association recently, is of particular significance in view of the paramount importance of increased production to meet the war needs, since industrial accidents constitute a serious brake on production. The Government's recognition of the importance of accident prevention is shown by the inclusion of safety as one of the subjects to be covered by the Factory and Welfare Advisory Board of the Ministry of Labour

and National Service. The Industrial Welfare Society and the National Safety First Association produce a joint accident prevention service for industry, and the latest addition is a booklet drawing the attention of new employees, with the aid of humorous illustrations, to the fundamentals of works safety. In addition, there are posters, pamphlets and various other leaflets specially applicable at the present time. Particulars can be obtained from the National Safety First Association, 52, Grosvenor Gardens, S.W.1.

Radio Export Trade

As a special effort to help the drive to increase exports now being made by the Radio Manufacturers' War Export Group, the *Wireless and Electrical Trader* is publishing three editions of a special export number. In addition to the normal features, this issue contains a 16-page export section which is printed in English, French, and Spanish respectively, for distribution in markets where those languages are used commercially.

Coal Production Committees

The Secretary for Mines announces that under the leadership of the Coal Production Council, presided over by Lord Portal, Production Committees have now been established in all the principal mining districts to take every possible step to meet the urgent demand for more coal. In order to assist these Committees and to maintain close co-operation with the Mines Department and the Council, the Secretary for Mines has appointed the following Coal Production Advisers for the districts named. Lord Portal will continue to be chairman of the Council and the other advisers have been added to its membership:—England: North-Eastern, Mr. Clive Cookson; North-Western, Sir Robert Burrows; West Midland, Mr. J. Cadman; Yorkshire and East Midland, Mr. Owen V. Smithson. Scotland: Sir Nigel Campbell. Wales: Lord Portal.

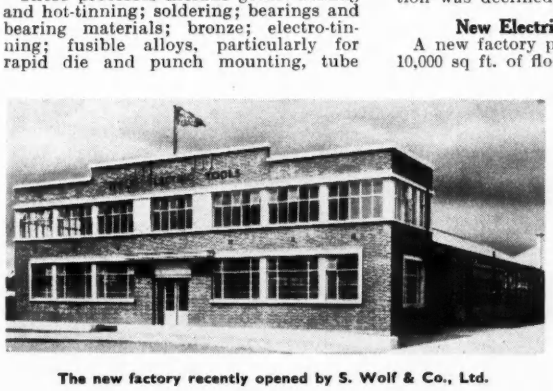
Wages in the Cable Making Industry

The Joint Industrial Council for the Electrical Cable Making Industry informs us that the June 1st cost-of-living figure (81 per cent. above the 1914 level) will not involve any alteration in wages on the third pay-day in July.

Assistance with Technical Problems

To-day, when the industries of the country are concentrating on a rapid increase in the production of war material, new problems are bound to arise. The International Tin Research and Development Council emphasises that it has accumulated much experience, particularly since the war began, on a wide range of processes in which tin is directly or indirectly concerned, and that this experience is available to engineering concerns without charge.

These processes include grease-tinning and hot-tinning; soldering; bearings and bearing materials; bronze; electro-tinning; fusible alloys, particularly for rapid die and punch mounting, tube bending, etc. Advice can sometimes be given by correspondence, but as in many cases personal contact is much more effective, the Council is prepared to send members of its staff to works to give assistance and advice.



The new factory recently opened by S. Wolf & Co., Ltd.

Worthing Council and J.I.C.

Recently Worthing Town Council decided to withdraw its representative from the District Joint Industrial Council, which subsequently requested that the local authority should receive a deputation. The Electricity and Waterworks Committee would not consent to this, and the Town Council at its last meeting upheld this decision by 24 votes to 9. Councillor R. Macpherson, who has represented Worthing on the J.I.C., said it would be only courtesy to receive the deputation, to which Major W. E. Acraman, chairman of the Electricity and Waterworks Committee, replied that the fullest consideration had been given to the matter. The Council agreed to receive a deputation of three members from the Worthing and District Trades Council.

Trade Announcement

The Westinghouse Brake & Signal Co., Ltd., has arranged for its representative, Mr. E. R. Rogers, to be available for any assistance that may be required in Scotland in connection with its metal rectifiers. Communications for Mr. Rogers should be addressed to the company's Scottish agents, J. E. Robson & Co., 11, Bothwell Street, Glasgow.

Canadian Approval of Electrical Equipment

With reference to standard specifications in respect of certain electrical apparatus and material issued under Part II of the Canadian Electrical Code, the Department of Overseas Trade has now received from H.M. Senior Trade Commissioner at Ottawa copies of Specification No. 47-1940 covering "Construction and test of air-cooled transformers (dry type)" which are available on loan to United Kingdom firms interested. Reference No. 5563/40 should be quoted.

Copies of a memorandum on the subject of the approval of electrical goods for sale in the Dominion are also available for distribution at the Department.

Rubber Works Machinery

In January, 1938, an interim report was presented by the committee appointed on the suggestion of Sir Duncan Wilson to advise on methods of fixing calenders and extruding machines in india rubber works. Six further meetings have been held and, as a result, agreement has been reached on this difficult problem, and a final report of the committee to the Home Office has now been published (H.M. Stationery Office, 6d. net).

In submitting the report, Mr. A. W. Garrett, H.M. Chief Inspector of Factories, says it is hoped that the adoption of the complete formal agreements and the suggestions of the committee will lead to the elimination of the serious accidents that have occurred in the past on these machines.

Registered Electrical Contractors

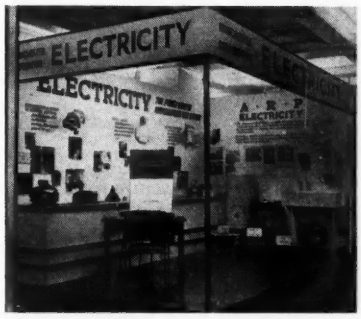
At its meeting on June 7th the Executive Committee of the National Register of Electrical Installation Contractors accepted applications for registration from the following contractors:—L. Mather, Salford; C. H. Simmonds, Wanstead; and Allenby & Stokell (Manchester), Ltd. At the same meeting one application was declined.

New Electrical Tool Factory

A new factory providing an additional 10,000 sq ft. of floor space has just been opened by S. Wolf & Co., Ltd., adjacent to their original Pioneer Works building, where production at full capacity will continue. Even without the war, it would still have been necessary to extend production space to cope with the rapidly increasing demand for the company's electric tools, but the present situation has emphasised the time and fatigue-saving features of equipment of this kind.

National Effort Exhibition

With the object of stimulating interest and action into the individual's own effort towards the national cause, Messrs. Lewis's, Ltd., held a comprehensive exhibition from June 6th to 15th at their Manchester stores. It was opened by Lord Derby, the Lord Mayor of Manchester (Alderman G. H. White) presiding, supported by M. Henry Bronnert (French Consul for Manchester), Sir Harry Haig (Regional Commissioner) and prominent people of the city connected with A.R.P., A.F.S., first-aid and other voluntary war services. Twenty windows were set out with displays, and a large section of the third floor was devoted to exhibits comprising graphic representations and tableaux of the work of the hospitals, A.F.S., first-aid, Citizens' Advice Bureau, rescue and decontamination squads, anti-scrap section, gas mask testing chamber, and the Corporation's gas, electricity and water undertakings. In a Kitchen Front Exhibition lectures and demonstrations of wartime cookery were given.



The Electricity Department's stand at the National Effort Exhibition at Manchester

Prices of Materials

The following changes in the prices of materials have taken place since June 5th:—

Henry Gardner & Co., Ltd., report June 19th: Mercury, £53 18s. 6d., £1 1s. 6d. dec. English block tin, £264, £13 dec.

Edward Till & Co. report June 19th: India-rubber, Para fine, 1s. 3½d., 1½d. inc.

New Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A new edition of the abridged list of "Witton" motors and motor starters, dealing with standard AC and DC equipment up to 50 HP Also leaflets Z8955 and IE9076 relating respectively to A.R.P. angle fittings for the illumination of essential night works on building construction, docks, railways, &c., and revised prices of A.R.P. external signs.

Rawlplug Co., Ltd., Rawlplug House, Cromwell Road, S.W.7.—A leaflet drawing attention to wartime uses of self adhesive tape, "Instanto" fire extinguishers, "Clear-view" anti-mist cream, and "Blastproof" protective laquer for window glass.

Rotherham & Sons, Ltd., Coventry.—A folder outlining the company's facilities for supplying precision instruments and parts.

Lincoln Electric Co., Ltd., Welwyn Garden City.—A leaflet giving particulars of the speed of operation and costs when using "Fleetweld" electrodes.

Crossley Brothers, Ltd., Openshaw, Manchester.—The May issue of "Crossley Chronicles" describing a selection of the company's Diesel engine power and lighting plant for A.R.P. emergency purposes.

Colt Ventilation, Ltd., Bush House, Strand, W.C.2.—Details and reports relating to the "Colt" black-out ventilator.

Aluminium Union, Ltd., The Adelphi, Strand, W.C.2.—The May issue of a series of folders entitled "Aluminium Technique," which deal with various aspects of the working of aluminium, particularly casting.

J. H. Sankey & Son, Ltd., Ilford.—A leaflet giving particulars of a new acid-resisting cement.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department, through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:

Present address of the Moto-Shaver Corporation, Ltd.

ELECTRICITY SUPPLY

Hawarden R.D.C. and Transmission Costs. Mill Electrification at Hull

Bath.—LOAN APPLICATIONS.—The Electricity Committee is applying to the Electricity Commissioners for the following loan sanctions: £35,000 to meet estimated expenditure on unspecified mains and services, and £4,000 for meters and time switches, both for the coming twelve months.

Bromley.—HIGHER CHARGES.—A revision of tariffs has been approved by the Town Council. The lighting rate is to be 5½d. per kWh (against 4½d.), power 1½d. (1d.), heating and cooking 1½d. (1½d.), storage water heating ¾d. (½d.), and cinema and theatre flat rate 3d. (2½d.). The standing charge under the domestic "all in" tariff is being raised from 10 per cent. to 12½ per cent. per annum, and those of the business, power, and cinema and theatre two-part tariffs are also being increased.

Burton-on-Trent.—RATE CONTRIBUTION.—At the last meeting of the Town Council it was stated that the Electricity Committee had decided to make a grant of £5,000 in aid of the rates. Alderman Giles, chairman of the Committee, said there was a surplus for the year of £22,222, compared with £17,435 for 1938-1939, but the improved result was more than accounted for by lower expenditure, on account of war conditions, on hire purchase, meters, &c., which would have the effect in future years of reducing consumption below what it would have been if hire and hire purchase had been continued normally.

Bury.—UNDERTAKING'S PROFIT.—In spite of restricted street and shop-window lighting there was a record output from the Bury electricity works last year. The profit exceeded £11,000, which has been transferred to reserve.

Carlisle.—SUBSTATION SITE.—The Electricity Committee has purchased a site at Harker for a sub-station.

LOAN FOR RURAL EXTENSIONS.—Permission has been obtained to borrow £2,453 for mains extensions in the rural area.

Chester-le-Street.—MOTORS ON HIRE.—A number of applications by farmers for the installation of electric motors on hire have been refused, but the Council has now decided that, in view of the need to help food production, the electricity undertaking shall be allowed to hire out motors in such cases.

PAYMENTS TO CONTRACTORS.—The Electricity Committee has granted local contractors an increase of 25 per cent. in the payments made for work under the Council's "free wiring" scheme.

Cornwall.—ROYAL ASSENT TO ACT.—The Royal Assent has been signified to the Cornwall Electric Power Act. Originally the measure was opposed by a number of local authorities in the county, led by Penzance Town Council and supported by the County Council, it being felt that a clause in a previous Act (1931) which related prices to dividends should be safeguarded. A satisfactory settlement was reached and the opposition was withdrawn.

Dover.—DEPARTMENT'S ACCOUNTS.—At a recent meeting of the Town Council a report was submitted showing that the year's working of the electricity undertaking resulted in a gross profit of £20,983. After making provision for loan charges and expenditure of a special nature appropriate to net revenue account a net profit of £1,399 remained, which was carried to reserve.

Eccles.—ELECTRICITY PROFIT.—A surplus for the past year of £8,867 is reported by the Electricity Committee.

Eton Wick.—EFFORTS TO SECURE SUPPLY FAIL.—For some time past the Eton Urban District Council has been endeavouring to obtain a supply of electricity for the Eton Wick district. It has now been informed by the Electricity Commissioners that they can do nothing further in the matter.

Hawarden.—TRANSMISSION COSTS.—It was reported at a meeting of the Rural District Council that the attention of the Electricity Commissioners had been drawn to the fact that if the present system of charging for electricity continued it would mean a permanent call upon the undertaking. There was an increase of £1,557 per annum in the fixed charge, irrespective of consumption, and the Council regarded this as an impossible position. The chairman said that the fixed charge for bulk supply to the rural area had gone up to £2,600, and this charge would continue to rise if there were no effective control over transmission costs. These costs were affecting not only Hawarden, but every other undertaking in North Wales. Further representations would be made before the 1940 figures were agreed to.

Hull.—MILL ELECTRIFICATION.—At a recent meeting of the Electricity Committee the general manager reported that he had successfully negotiated with British Oil & Cake Mills, Ltd., for the complete electrification of the company's Eagle Mills.

Lichfield.—OVERHEAD LINE CONSTRUCTION.—Permission has been obtained by the Electricity Committee to erect overhead lines to Wissage.

Macclesfield.—SUPPLY EXTENSIONS.—The Electricity Committee is to extend the mains to provide a supply to the Styperson and Breck quarries at Adlington. The Committee has also promised to consider an application from the Rainow Parish Council for extensions in the Rainow district. Application is being made for sanction to borrow £22,500 for mains and services; £5,000 for sub-stations; £5,000 for meters; £2,000 for wiring installations and £4,000 for motors and apparatus for hire.

Plymouth.—PRICE INCREASE.—It has been decided to increase electricity charges by 10 per cent.

DEPARTMENT'S SURPLUS.—The revenue account of the Electricity Department for the year ended March 31st last shows a net surplus of £2,562.

Salisbury.—OPTION TO PURCHASE UNDERTAKING.—The Town Council has adopted a recommendation of the Finance Committee that steps shall be taken to secure an extension by one year of the time for giving the Salisbury Electric Light & Supply Co., Ltd., notice under the Council's option to purchase the undertaking, such period to be further extended should the war not be ended by that time.

Taunton.—HIRED APPLIANCES.—The Electricity Committee has decided, in view of the present national emergency and the need for restricting demands upon manufacturers, that for the time being no new apparatus shall be purchased for hiring purposes, except so far as may be required for replacements.

Overseas

India.—COMPANY'S SILVER JUBILEE.—To commemorate the silver jubilee of the Karachi Electric Supply Corporation, Ltd., the *Daily Gazette* (Karachi) recently produced a sixteen-page supplement dealing with the electrical progress of the city since the opening of the central generating station in April, 1915, by the late Sir Montagu de P. Webb, the founder and first chairman. The present chairman and resident manager is Mr. H. J. Wright, M.Eng., A.M.I.E.E., A.M.I.Mech.E.

Russia.—NEW TRANSMISSION LINE.—Work on the biggest transmission line in the Soviet Union, from the Dnieper river to the Donetz coalfields, is nearly complete, learns *Reuter's Trade Service* from Russian papers. Work on the Donetz section, from the Zuyevka power station to Kurakhovka, was recently finished. The distance is about fifty miles and the cable is of steel and aluminium. All that now remains is to join the line up with the Dnieper section, and there will soon be a continuous 220-kV line between the two big stations of Zuyevka and Lenin Dnieproges.

The economic importance of the Dnieper-Donbass line to industry in the Donbass and Pridnieprovye regions is considerable. At times of high water in the Dnieper and full loading of the Dnieproges turbines the Donetz coal mines and factories will receive an additional 100,000 to 120,000 kW. On the other hand, during low-water periods on the Dnieper the deficiency at Dnieproges will be made up from the thermal stations in the Donbass region and the Kurakhovka station.

TRANSPORT

Newcastle-on-Tyne.—TROLLEY-BUS ORDER APPROVED.—The City Council's Provisional Order regarding the introduction of trolley-buses on further routes in the city has been approved by the Unopposed Bills Committee of the House of Commons. The City Council has given an undertaking that the work will not be carried out during the war without the consent of the Ministry of Transport.

Plymouth.—TRAM DEBT REPAYMENT.—The Transport Committee has allocated £12,955 of the year's net surplus of £13,079 to repayment of debt on obsolete tramcars.

Southampton.—TROLLEY-WIRE ANTI-FLASH DEVICE.—Several means have been tried in various towns to suppress the arc-flashing that occurs at night on the overhead conductors of tramway and trolley-bus systems, the object being to reduce its visibility from the air during black-out periods. At Southampton several hundred anti-flash shields are being fitted to the suspension insulators over the trolley wires. The City Transport Department is dealing first with the up gradients where flashing is most noticeable. The shields are made of curved metal sheet, about 25 in. long, projecting about 5 in. beyond the end of the suspension where the flash occurs. The sides of the shields curve downward below the level of the trolley wire so as to mask the flash on a level with the conductor wire.

Wolverhampton.—PROFIT MAINTAINED.—A rise in the gross surplus on the

(*Continued on page* 665)

Repairing Air-raid Damage

FURTHER details of the scheme, referred to in our issue of March 1st (page 256), for the mutual assistance and co-operation of municipal electricity undertakings in Greater London in the event of damage to their plant and services by air raids have been given to us by Mr. J. D. Spark, electrical engineer and manager to the Willesden Borough Council Electricity Department, who has been the prime mover in its organisation.

All the undertakings concerned have, of course, received from the Electricity Commissioners, through Mr. F. E. Procter, the Electricity Liaison Officer, London Civil Defence Region, a questionnaire relating to the spare cables, transformers and switchgear they have available. The scheme referred to, which is entirely voluntary, is intended to carry matters a stage further and provide facilities for neighbouring undertakings to give and receive assistance not only in the way of spare plant, but also in the pooling of jointers, jointing kit, transport, lifting tackle, &c. Each undertaking therefore has prepared a list giving all relevant details. Agreements have been reached regarding charges for plant, labour, &c., and such matters as the effect of the scheme on workmen's compensation have been investigated.

For convenience the undertakings have formed themselves into five quite arbitrary groups, some undertakings being in two or more. The following are the respective secretaries:—North-West Area, Mr. J. D. Spark; South-East, Mr. S. E. Elliott (Woolwich); South-West, Mr. E. J. Jarvis (Kingston-on-Thames); East, Mr. J. E. Wetherall (Leyton); and North-East, Mr. E. A. Mills (Hackney). We understand that every electrical engineer in the area concerned has received sanction from his Council to participate in the scheme.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

423. "Focusing magnets for cathode-ray tubes." Kolster-Brandes, Ltd., and C. N. Smyth. November 18th, 1938. (521439.)

25114. "Noise-limiting circuits for carrier-wave communication systems." A. A. Thornton (Philco Radio and Television Corporation). August 26th, 1938. (521490.)

25116. "Noise-limiting devices for use in electric transmission systems." A. A. Thornton (Philco Radio and Television Corporation). August 26th, 1938. (521589.)

27392. "Electric protective arrangements." A. Reyrolle and Co., Ltd., H. Leyburn and A. F. B. Young. September 20th, 1938. (521541.)

27393. "Electric protective arrangements." A. Reyrolle and Co., Ltd., and H. Leyburn. September 20th, 1938. (Addition to 453525.) (521542.)

27394. "Electric protective arrangements." A. Reyrolle and Co., Ltd., and H. Leyburn. September 20th, 1938. (Addition to 453525.) (521543.)

28478. "Step-by-step printing-telegraph apparatus." Creed and Co., Ltd., A. E. Thompson and R. D. Salmon. September 30th, 1938. (521591.)

30014. "Electric protective arrangements for constant-current systems." British Thomson-Houston Co., Ltd. October 16th, 1937. (521443.)

30045. "Radiological apparatus." Schall and Son, Ltd., and L. G. Haine. October 17th, 1938. (521390.)

30249. "Electric cables." Callender's Cable and Construction Co., Ltd., and J. Urmstron. October 19th, 1938. (521549.)

33161. "Means for securing electric storage batteries." J. Lucas, Ltd., and G. D. Spencer. November 15th, 1938. (521403.)

33186. "Thermionic valves." Standard Telephones and Cables, Ltd., and F. D. Goodchild. November 15th, 1938. (521407.)

33187. "Public address horn-type loudspeakers." Standard Telephones and Cables, Ltd., and J. C. Curry. November 15th, 1938. (521408.)

33190. "Time-base circuits." Kolster-Brandes, Ltd., and W. F. Tedham. November 15th, 1938. (521409.)

33228. "Device for operating high-pressure metal-vapour electric discharge lamps having thermionic electrodes." Quarzlampen Ges. November 25th, 1937. (521498.)

33237. "Electric flat-iron for a support forming a current intake. J. Lobstein. November 18th, 1937. (Addition to 501073.) (521500.)

33362. "Electrical logs of the impeller type." W. Ottway and Co., Ltd., G. H. Kackman and G. M. Newbery. November 16th, 1938 (Cognate application 23788/39). (521412.)

33378. "Alternating current electric meters, instruments, relays or the like." T. C. Richardson. November 17th, 1938. (521555.)

33415. "Electric switch mechanisms suitable for controlling road-traffic signals." Gowshall, Ltd., and A. L. Marklew. November 17th, 1938. (521451.)

33525. "Electrical fuses." C. W. Cox. November 18th, 1938. (521512.)

33566. "Manufacture of electric dry-contact rectifiers." Westinghouse Brake and Signal Co., Ltd. December 27th, 1937. (521455.)

33568. "Manufacture of rectifier elements of the dry surface contact type." Westinghouse Brake and Signal Co., Ltd. April 20th, 1938. (531456.)

33582. "Electron-discharge devices." Standard Telephones and Cables, Ltd., and A. I. Vangeen. November 18th, 1938. (521558.)

33583. "Carrier transmission systems." Standard Telephones and Cables, Ltd., and B. B. Jacobsen. November 18th, 1938. (521559.)

33586. "Printing-telegraph apparatus." Creed and Co., Ltd., A. E. Thompson and R. D. Salmon. November 18th, 1938. (521560.)

33606. "Telephone systems." Siemens Bros. and Co., Ltd., and B. A. Hensler. November 18th, 1938. (521419.)

33625. "Apparatus for starting an electric spark." T. Zaidan Hojin Rikagaku Kenkyujo Schimzu, and M. Hirata. November 18th, 1938. (521563.)

33652. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. November 18th, 1937. (521423.)

33653. "Circuit arrangements employing thermionic valves and thermionic valves therefor." November 18th, 1937. (521424.)

33673. "Electrical condensers." Standard Telephones and Cables, Ltd., J. A. Leno and J. C. Edwards. November 19th, 1938. (521604.)

33717. "Tool for use in stripping the insulation from electric cables." November 19th, 1938. P. C. Major. (521433.)

33766. "Supporting means for axle-hung electric motors on electrically propelled vehicles." English Electric Co., Ltd., and E. A. Binney. November 21st, 1938 (Cognate application 24863/39). (521605.)

33833. "Mounting arrangements for microphones." J. E. Pollak (Associated Electric Laboratories, Inc.). November 21st, 1938. (521475.)

33834. "Microphones." J. E. Pollak (Associated Electric Laboratories). November 21st, 1938. (521476.)

33836. "Television system." I. L. Maguire. December 3rd, 1937. (521477.)

33949. "Television systems." Kolster-Brandes, Ltd., and C. N. Smith. November 22nd, 1938 (Addition to 520235). (521522.)

33962. "Alternating-current electric motors." N. Japolsky. November 22nd, 1938. (521570.)

34003. "Low-frequency induction smelting-furnaces." L. Westerschulte. November 22nd, 1937. (521574.)

34038. "Electric tumbler switches." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. November 23rd, 1938. (521612.)

34040. "Electric torches." F. J. Miller. November 23rd, 1938. (Cognate application 29411/39.) (521613.)

34050. "Electrical switches and contacts." H. J. Osborn and H. J. Osborn & Sharp. November 23rd, 1938. (521615.)

34065. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and J. H. Pollard. November 23rd, 1938. (521617.)

34066. "Electric over-voltage protective switching devices." British Thomson-Houston Co., Ltd., and W. J. Scott. November 23rd, 1938. (521618.)

34094. "Automatic boosting or regulating apparatus for alternating electric current circuits." Westinghouse Brake & Signal Co., Ltd., S. A. Stevens and A. H. B. Walker. November 23rd, 1938. (521625.)

34397. "Electric hand-lamps." C. A. Raman. November 25th, 1938. (521524.)

1939.

7416. "Distant-control electric apparatus for signalling from a central station over the supply main." V. Valvassori. March 7th, 1939. (521582.)

10518. "Terminal for electrical conductors." J. M. White. August 11th, 1938 (521536.)

12039. "Piezo-electric devices." Brush Crystal Co., Ltd. April 22nd, 1938. (521435.)

Transport (*Concluded*)

trolley-bus account from £79,070 to £85,554 and a small increase in the case of motor-buses, from £25,154 to £25,896, are shown in the report of the Transport Committee for the year ended March 31st last. After deducting loan charges, &c., there was a net surplus of £15,220, nearly the same as in the previous year (£15,550). Of this sum £10,000 has again been contributed to the relief of the rates.

Statistics presented by Mr. C. Owen Silvers, the general manager, show that trolley-buses carried 51.1 million passengers and motor-buses 12.9 millions. Trolley-buses, of which the Department owns a fleet of 125, used 2.059 kWh per vehicle mile. The black-out caused a drop in the average speed from 9.312 to 8.894 MPH, but this was still higher than that of motor-buses (8.056 MPH). The mileage covered by trolley-buses was 4,391,891 and by motor-buses 1,666,347, the average number of vehicles in use per day being 107 and 53 respectively. Revenue per vehicle-mile was 16.437d. and 15.516d.; working expenses, 11.670d. and 11.390d.; and average fare charged per mile, 0.932d. and 1.049d. For trolley-buses the percentage of working expenses to total revenue was 70.99 and for motor-buses 73.41.

New Trolley-buses. — The Transport Committee is to purchase ten trolley-buses at an estimated cost of £25,000.

A.R.P. Speed Jointing

While the full effects of air raids on cable systems may not be foreseeable, precautions may be taken with a view to expediting restoration of supply. Some practical hints are given by the Dussek Bitumen & Taroleum Co., Ltd., in a new technical publication (ETD. 7/2/40-A), which is supplementary to an earlier one (ETD. 7/39-A), reviewed in our issue of October 6th.

It is pointed out that a 500-lb. bomb could destroy everything within a radius of 50 ft. Water from a damaged main might find its way some distance into a cable run, and some hours might elapse before the main was empty after being turned off. After the crater is drained, the cables have to be supported to avoid pull on the joints at each side. The presence of coal gas may prevent the use of flame for heating oil for the detection of moisture in the paper. It is suggested, therefore, that the repair length of cable should by-pass the crater, emergency joints being installed some feet back on each side of it.

"Dussek" speed joints, it is claimed, can be used air-filled up to 11 kV for some hours (with the ends of the paper insulation wrapped with non-hygroscopic tape) until cold-pouring compound is prepared for filling the wooden cable boxes.

This type of joint consists of "Trinidite" metal cable connectors, plastic sealing compound for packing the cable entries and cold-pouring compound, "Permali" separators and a wooden box. The connector comprises a hexagonal metal bar bored through its centre in which is a sleeve fitting into a coned nut at either end giving good electrical and mechanical connection, as indicated by N.P.L. reports. The basis of Permali is wood impregnated with synthetic resins and highly compressed. The box and its lid are shaped to allow the compound to settle with the assistance of the weight of air into a solid mass without voids. The joint can be made before the box is brought under it. Its components can be removed after a permanent joint has been made and used for later temporary work.

Normal bituminous cable-box compound may be used if heated some distance from the crater, and with the supply disconnected for a short time it could be poured at a much lower temperature than that usually specified, the cable being made alive soon after. Where the crater is by-passed, the wooden joint boxes can be placed on firm soil and left until other authorities have completed their work. The inserted cable length should be ample for later permanent laying. When the crater is not by-passed, sandbags could provide a foundation for the new cable, but might have to be disturbed for repairs to water mains.

FINANCIAL SECTION

New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares.

New Companies Registered

Victoria Instrument Co., Ltd.—Private company. Registered June 10th. Capital, £15,000. Objects: To acquire the business of a manufacturer of scientific instruments and electrical apparatus and appliances carried on by H. D. Quilter, at Midland Terrace, Victoria Road, Willesden, as the Victoria Instrument Co. Permanent directors: E. W. Jermey, 10, Rowdon Avenue, Willesden, N.W.10; H. D. Quilter, 40, Fordwych Road, Hampstead, N.W.2; and C. E. P. Taylor. Solitor: E. H. Hiscocks, 43, Craven Park, Willesden, N.W.

E. Westrap, Ltd.—Private company. Registered in Dublin May 28th. Capital, £2,000. Objects: To carry on the business of manufacturers of all kinds of refrigerating plant, accessories, components, and utensils, including automatic electric refrigerators, &c. The subscribers are: P. J. J. Byrne, 56, Kenilworth Square, Rathgar, Dublin, and E. E. Westrap, 9, Casimir Avenue, Harolds Cross, Dublin.

Irish Fuses, Ltd.—Private company. Registered in Dublin May 31st. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, mechanical engineers, suppliers of electricity, etc. Directors: A. Mansour, 31, Cranleigh Drive, Brooklands, Manchester; A. Sevitt, 1, Clareville Road, Dublin; and M. Cowan, 24, Raymond Terrace, South Circular Road, Dublin.

Morrison's Clock Co., Ltd.—Private company. Registered June 8th. Capital, £5,000. Objects: To acquire from H. K. Morrison the invention relating to electric synchronous-motor clocks and the British patents and world rights; and the apparatus, tools and jigs for the manufacture thereof; to carry on the business of manufacturers of and dealers in electric clocks and components, and electric motors; electricians, radio and television engineers, &c. Directors: Lt.-Col. C. J. M. Thornbill, 34, Dover Street, W.1; Major P. H. R. Jephson, 3, South House, Rosemore Street, S.W.3; and J. Freeman, address not stated. Registered office: High Holborn House, 52-4, High Holborn, W.C.1.

Lighting for Industry, Ltd.—Private company. Registered June 7th. Capital, £100. Objects: To carry on the business of electrical and general engineers and contractors, &c. Directors: L. Robinson, 31, Sedley Rise, Loughton, Essex; and R. Chinn, 31, Gloucester Court, N.W.11. Secretary: J. Tucker.

T. Tomlinson, Ltd.—Private company. Registered June 15th. Capital, £1,500. Objects: To carry on the business of electrical, mechanical, refrigerating and cold storage, constructional, civil, consulting and general engineers, &c. Permanent directors: Thos. Tomlinson, 371, Rochdale Old Road, Bury, and two others. Registered office: 227, The Rock, Bury, Lancs.

Companies' Returns

Statements of Capital

Strange and Sons Electrical Engineering Co., Ltd.—Capital, £200 in £1 shares. Return dated January 4th, 1940. 116 shares taken up. £1,160 paid (including £9 per share premium). Mortgages and charges, £500.

Simmonds and Stokes, Ltd.—Capital, £15,000 in £1 shares. Return dated March 7th, 1940. 10,204 shares taken up. £1,725 paid. £8,479 considered as paid. Mortgages and charges at date of return, £11,000. Since registered: debentures for £2,950 all issued April 23rd, 1940.

Thornbury & District Electricity Co., Ltd.—Capital, £15,000 in £1 shares. Return dated June 5th, 1939 (filed February 29th, 1940). 12,404 shares taken up. £8,004 paid. £4,400 considered as paid Mortgages and charges, nil.

H. J. Cash & Co., Ltd.—Capital, £25,000 in £1 shares. Return dated March 14th, 1940. 20,000 shares taken up. £15,000 paid. £5,000 considered as paid. Mortgages and charges, nil.

Electrical Distribution of Yorkshire, Ltd.—Capital, £3,200,000 in £1,200,000 6 per cent. cumulative preference stock, £1,500,000 ordinary stock, and £500,000 unissued stock. Return dated April 1st. All preference and ordinary stock taken up. £2,700,000 paid. Mortgages and charges, £500,000.

Keswick Electric Light Co., Ltd.—Capital, £20,000 in 5,000 preference and 15,000 ordinary shares of £1. Return dated April 9th. 4,000 preference and 15,000 ordinary shares taken up. £13,000 paid on 13,000 ordinary shares. £6,000 considered as paid on 4,000 preference and 2,000 ordinary shares. Mortgages and charges, nil.

Sussex Electricity Supply Co., Ltd.—Capital, £197,000 in £1 shares. Return dated May 1st. All shares taken up. £197,000 paid. Mortgages and charges, nil.

Llansilin Electricity Co., Ltd.—Capital, £1,500 in £1 shares. Return dated July 12th, 1939 (filed February 23rd, 1940). 1,260 shares taken up. £1,260 paid. Mortgages and charges nil.

M-L, Ltd.—Capital, £5,000 in £1 shares. Return dated January 12th, 1940. Two shares taken up £2. paid. Mortgages and charges nil.

Increases of Capital

Electrocult, Ltd.—The nominal capital has been increased by the addition of £2,000, in £1 ordinary shares, beyond the registered capital of £3,000.

H. C. Troldahl, Ltd.—The nominal capital has been increased by the addition of £7,000, in £1 ordinary shares, beyond the registered capital of £5,000.

Gorseinon Electric Light Co., Ltd.—The nominal capital has been increased by the addition of £40,000, in £1 ordinary shares, beyond the registered capital of £60,000.

Mortgages and Charges

Petters, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated May 31st, 1940, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Notley Power Units, Ltd.—Debenture, charged on 500,000 No. 8 batteries and 100,000 No. 2B batteries, dated May 21st, 1940, to secure £6,000. Holders: Splendor, Ltd., Beastmarket Hill, Nottingham.

Cray Electrical Motors, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated June 3rd, 1940, to secure £4,000. Holders: London and Commercial Electrical Stores, Ltd., 13, Farringdon Avenue, E.C.

Britannic Electric Cable and Construction Co., Ltd.—Further debenture, charged on the company's undertaking and property, present and future, including uncalled and unpaid capital, dated May 15th, 1940 (supplemental to debentures dated June 28th, 1938, and October 11th, 1939), to secure £25,000. Holders: Westminster Bank, Ltd.

Llanidloes Electric Light Co. (1926), Ltd.—Satisfaction to the extent of £600, on December 9, 1939, of debentures authorised June 5th, 1936, and registered June 9th, 1936. Notice filed June 10th, 1940. (According to the register of mortgages, the debentures registered June 9, 1936, originally secured £2,000.)

Receiver Appointed

Atkins Electrical Appliances, Ltd.—W. F. Wyatt, of Sun Buildings, Bennetts Hill, Birmingham, was appointed receiver and/or manager on May 30th, 1940, under powers contained in debentures dated July 21st, 1936.

Private Arrangement

Page & Miles, Ltd., radio and electrical engineers, Marlborough Place, and 60, Weston Place, Brighton, Sussex. An informal meeting of creditors was held recently, when figures were submitted showing liabilities of £10,731 and assets of £14,917, making a surplus, as regarded the creditors, of £4,186. The business was established more than sixty years ago; the company was formed in June, 1898, with a nominal capital of £12,000, which was later increased to £24,000. The issued capital was £18,710. The trading had been very successful and up to 1932 a dividend of 10 per cent. was paid on the ordinary shares. The turnover had averaged £50,000 per annum, but during 1939 it declined to £39,000. With the exception of 1935 losses had been incurred on the trading each year since 1932. The accumulated losses totalled £5,742, whilst in the last two years heavy bad debts had been incurred.

It was decided that a committee of the five principal creditors should be appointed to see whether some scheme could be formulated.

A meeting of creditors is to be held at the offices of J. H. Penfold and Clamp, 2, Marlborough Place, Brighton, on June 24th.

Company Liquidations

Locke & Soares, Ltd., 24, Coleman Street, E.C., electrical engineers and contractors.—The first meetings of creditors and shareholders under the compulsory liquidation of this company were held on June 11th at Carey Street, W.C. Mr. Bird, Senior Assistant Official Receiver, reported that for many years Mr. A. H. Locke had carried on business in partnership with the late Mr. F. B. Soares. The partnership was terminated in 1935, after which Mr. Locke carried on alone.

On January 31st, 1939, the company acquired the business as a going concern for £9,998 and an undertaking by the company to pay certain of the existing liabilities of the business. Payment was made by means of shares which, with £2 subscribed in cash, formed the capital of the company. In January, 1939, debentures for £4,500 were issued, and in March last Mr. J. C. Gardner was appointed receiver on behalf of the bond holder.

A draft statement of affairs showed unsecured debts, £2,000; debentures, £4,500; and assets, £3,450. A resolution was passed for Mr. B. A. Jacobs, C.A., to act as liquidator with a committee of inspection.

Birmingham & Western Districts Tramways Co., Ltd., and the **Gloucestershire Electric Power Syndicate, Ltd.**—Meetings July 17th at 88, Kingsway, London, W.C.2, to receive an account of the winding up by the liquidators, Messrs. T. H. Underhill and E. H. G. Douse.

Electric Service (Exeter), Ltd.—Winding up voluntarily. Liquidator, Mr. F. Smith, 22, Southernhay East, Exeter.

Magnus Volk, Ltd.—Meeting under sections 236 and 283 (1) (b) of the Companies Act, 1929, on July 12th, at Regent House, Princes Place, Brighton, to receive an account of the winding-up by the liquidator, Mr. F. V. Arnold.

Bankruptcy Proceedings

J. K. Thornborough and **E. C. Thornborough** (J. K. Thornborough & Co.), electricians, Crescent Road, Windermere.—Receiving order made June 7th on debtors' own petition.

H. A. Smith, electrical engineer and contractor and neon sign engineer, 76, Canterbury Street, Gillingham.—First meeting June 21st at 280a, High Street, Rochester. Public examination July 22nd, at the Court House, Rochester.

J. Stubbs and **J. A. P. Boulton** (John Stubbs & Co.), electrical engineers, 39, Bootham, York.—First and final dividend of 10d. in the £, payable June 21st at the Red House, Duncombe Place, York.

(Continued on page 669)

STOCKS AND SHARES

TUESDAY EVENING.

THE unexpected news of the action of France at the beginning of this week had the effect, in Stock Exchange markets, of bringing business nearly to a standstill. The definite news, of which advance rumours had been in circulation, came through on the loudspeakers in the various markets at one o'clock on Monday. It was received in complete silence. Nor can it be said that markets have come to life since the broadcast. Those gilt-edged stocks that are subject to the imposition of the minimum-price rule, mostly retreated to the shelter which the provision affords. This means, of course, that sales, except in small amounts, or in such cases as those where a holder of stock wishes to sell one thing in order to buy another, have become almost impossible.

With events moving as rapidly as they are doing, the position may be so changed on Friday in this week that even to attempt to estimate what is likely to happen in the next two days will be to invite discomfiture. On this, Tuesday evening, the majority of prices, not only in our own lists but throughout the Stock Exchange markets, show heavy falls as compared with those of a week ago.

Reinvestment in War Stocks

A certain amount of the selling that has depressed Stock Exchange prices this month is admittedly due to the desire on the part of some shareholders to increase their stake in Defence Bonds, Saving Certificates and other forms of war loans. The sellers declare that they want to help their country; that their floating supply of cash is insufficient to subscribe for any but small sums of national stock; and that they are ready to sacrifice capital and investments in order to raise money for taking-up war stocks. How far their object is achieved by this process of exchange may be a difficult problem to decide. The general markets are so tender that any pressure to sell, however slight it may be, causes contraction of credit and thereby reacts, indirectly, upon the financial position as a whole. To buy the seller's shares, a purchaser must be found who himself might put up the money for war stocks if he did not use it for the former purchase. What the Government wants is new money. To force existing holdings upon an unwilling market is not likely to strengthen prices even of the war loans in which the proceeds of sale are reinvested.

Railway and Traction Issues

With no buyers about, and with a little selling on behalf of deceased accounts, Southern Railway 5 per cent. preference has fallen 9 points to 70½. Stock has changed hands at 67. The company's 5 per cent. preferred, at 40, is down 4 on the week. The Home Railway market as a whole became disorganised by the French news. Nor was the weakness confined to stocks in companies on this side. Brazilian Tractions, at 5⅛, are ⅛ lower. In the Home traction group, British Electric Traction Deferred, at 500, shows a fall of 75. Thomas Tilling are a florin lower at 31s. 3d. Lancashire Transport at 32s. 6d. have given way ½.

Electricity Supply Shares

Shares in the list of home electricity supply companies have gone back, as our list shows, from 6d. to 2s. 6d., the latter fall occurring in County of London, Metropolitan, and Scottish. Northmet 6 per cent. preference at 25s. 6d., Yorkshire Electrics at 30s. and Southern Areas at 15s., are 2s. lower. Most of the other falls in the ordinary shares connected with this group average about 1s. 3d. Curiously enough, there has been a general and fairly severe fall in the preference shares of the supply companies. No more than two months ago, the pendulum swung in the opposite direction. Investment was buying any preference shares it could lay its hands upon, owing to the uncertainty aroused over the possible dividends on ordinary shares through the operation of the Limitation of Dividends Bill and the 100 per cent. E.P.T. The former has been abandoned, and the fall in the preference shares of so many different companies during the past few days must be attributed to the fact that there are so few buyers of fixed dividend stocks.

It may be of interest to mention that 2,000 shares of one of the companies quoted in our list came in for sale last week, and the best bid which could be obtained was 4s. below the middle price officially quoted. The seller refused the bid, and somewhat indignantly, to which the prospective purchaser retorted that he—the seller—might consider himself fortunate to get a bid of any sort in days like these. The question of value is one which carries little weight at the moment, for the simple reason that, if this country were to be invaded, it would be extremely difficult to assess the actual value of any ordinary stock or shares.

W. T. Henley's

At first blush, W. T. Henley's profit and loss account looks disappointing, showing as it does a decrease of £30,000 in the balance of the trading account. The total is £415,204. From this balance of the trading account, however, provision has been made for taxation, bad debts and contingencies. The amount of the provision is not stated, but doubtless the diminution in profits is due to the way in which Henley's—a very conservatively managed undertaking—has treated possible eventualities. The price of the shares is unchanged at 16s. 3d., at which the yield comes to £6 3s. per cent. on the money.

Callender's Cable Report

The Callender's Cable report showed a balance to the credit of profit and loss account at the end of last December of £670,908, being no less than £222,000 more than the same item in the previous year's accounts. The net result, however, tells a different story, for this year there remains £691,956 for disposal, against £809,135 at the end of December, 1938. Callender's have provided £140,000 extra for income tax, £15,000 more for National Defence Contribution and £10,000 for depreciation. The dividend, however, on the ordinary shares remains the same, namely 15 per cent. The transfer to reserve is £125,000, being half of last year's contribution and the carry forward of £398,000 is £8,000 higher.

Callender's shares are amongst the few for which there have been buyers this week. Difficult as it has been to sell other stocks and shares, Callender's have been wanted at 54s., at which price the yield on the money comes to 5½ per cent.

The Fall in Industrials

The General Electric Company's dividend announcement is usually expected to make its appearance in June, but this year the declaration will be made next month. The price of the shares has fallen 8s. 9d. to 61s. 3d. Shares have been changing hands at £3. British Insulated, at 75s., are 7/6 down. International Combustions shed 7s. 6d. Associated Electricals dropped 5s. to 31s. 3d. Tube Investments, at 70s., have shed 7s. 6d. Murex are 6s. 3d. lower at 62s. 6d. Falls of 1/6 and ⅛ are common throughout the list. Iron and steel shares have suffered in company with practically everything else in the industrial market. Babcocks, at 33s. 9d., have shed 3s. 9d. Vickers are lowered 1/6 to 11s. 3d.

These days it is difficult to tell, without precise information, to what extent the ramifications of business extend in the case of any industrial company. For instance, Babcock & Wilcox are said to have subsidiaries on the Continent and elsewhere, all of them contributing usefully to the revenue of the parent. If any of these subsidiaries should fall into the hands of the enemy, the effect upon earning power may prove noticeable. To the uncertainty which is felt on this head may be ascribed at least a part of the reluctance of public money to flow into industrial shares at what appear to be such tempting prices as those now current.

Victoria Falls and Power

Fifteen per cent. for the year is again to be the dividend on Victoria Falls and Transvaal Power ordinary shares, the price of which is 5s. down at 60s. The company did well in the year recently ended, its profits being nearly £30,000 up. The mining companies which are its principal customers have also been declaring their dividends during the past few days: dividends which show few changes from those of the corresponding six months in 1939. From the point of view of public interest, the markets both in South African mining shares and in Victoria Falls ordinary are so devoid of attraction, owing to the concentration of the public mind upon other matters, that the dividend announcement on Victoria Falls passed almost without comment.

Globe Telegraph Dividend

Globe Telegraph and Trust ordinary shares have come back to 27s. 6d. ex dividend upon the announcement of a final dividend by the Trust of 2¼ per cent. tax free, making 6 per cent. tax free for the year and a bonus of 2½ per cent. This 8½ per cent. for the year goes against 7½ per cent. dividend and 2½ per cent. bonus in the previous twelve months, the bonus being declared, as usual, as a distribution from proceeds of sales of 4½ per cent. funded income stock issued by Cable and Wireless (Holding). The funded stock came to the Trust Company in satisfaction of arrears of dividend on Cable and Wireless 5½ per cent. preference stock.

There is not a great deal of the funded stock left for further distribution. Market calculations think that there may be sufficient to permit of the bonus being maintained for another year, but there is no certainty as to this. The preference shares have also weakened to a slight extent, and although a reduction in the ordinary dividend was not by any means unexpected, its actual declaration served to bring in a little selling. Cable and Wireless issues are again flat, the preference being 5 down at 77½ and the ordinary 3 at 37½. Marconi Marines weakened to 18s. 9d. But American Telephone and Telegraph stock has gained 10 dollars, rising to 190.

"Plastic" Copper

THE production of a new type of copper is announced by the Phelps Dodge Copper Products Corporation. It is said to be nearly as malleable as gold, the improved metal being made without melting from electrolytic cathode copper, by plastic conversion to commercial shapes at great pressure in a reducing atmosphere at high temperature. It will be produced at new works at Bayway, N.J., U.S.A.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 Highest	1940 Lowest	Dividend Previous	Dividend Last	Middle Price June 18	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole	63/6	50/–	15	15	50/–	–½	6 0 0
British Power and Light	30/–	21/–	7	7	21/–	–2/–	6 13 4
City of London	28/–	21/–	7½	7½	21/–	–1/–	7 2 10
Clyde Valley	38/6	31/–	8	8	31/3	–⅛	5 2 5
County of London	43⅜	26/–	10½	10½	26/3	–½	8 0 0
Edmundson's :							
7% Pref.	31/6	28/–	7	7	30/–	–½	4 13 4
Ord.	27/6	20/–	9	6	21/–	...	5 14 3
Elec. Dis. Yorkshire	40/3	35/–	9	9	34/6	...	5 4 4
Elec. Fin. and Securities	41/3	38/6	12½	12½	38/9	...	6 9 0
Elec. Supply Corporation	46/3	41/–	12	11½	41/3	...	5 11 3
Isle of Thanet	16/–	9/–	4	4	9/–	–⅛	8 17 10
Lancs Light and Power	33/–	26/–	7½	7½	26/3	–½	5 14 3
Llanelly Elec.	21/–	19/6	5½	5½	20/–	–6d.	5 10 0
Lond. Assoc. Electric	21/–	14/–	7	5½	14/6	–1/9	7 11 8
London Electric	37/6	21/–	8	7½	21/3	–⅛	6 16 6
London Power Deb. Red.	105½	103	5	5	104½	...	4 15 6
Metropolitan	41/6	26/–	12	10	26/3	–½	7 12 4
Midland Counties	39/–	30/–	8	8	30/–	...	5 6 8
Mid. Elec. Power	40/–	35/–	8	9	35/–	–⅛	5 2 10
Newcastle Elec.	29/9	26/–	7	7	26/3	...	5 6 8
North Eastern Electric :							
Ordinary	31/6	22/–	7	7	22/–	–6d.	6 7 5
7% Pref.	32/6	28/6	7	7	28/9	–9d.	4 17 3
Northampton	48/–	41/–	10	10	42/6	...	4 14 1
Notting Hill 6% Pref. (£10)	10¾	10	6	6	10¾	...	—
Northmet Power :							
Ordinary	42/3	27/–	10	10	27/6	–½	7 5 6
6% Pref.	29/–	25/–	6	6	25/6	–2/–	4 14 1
Richmond Elec.	24/6	22/–	7	6	22/–	...	5 9 1
Scottish Power	38/–	27/6	8	8	27/6	–½	5 16 5
Southern Areas	21/3	15/–	5	5	15/–	–2/–	6 13 4
South London	23/3	21/–	7	7	21/3	...	6 11 9
West Devon	20/–	18/6	5	5	20/–	...	5 0 0
West Glos.	21/3	16/6	2½	4½	17/6	–⅛	5 2 10
Yorkshire Elec.	40/–	30/–	8	8	30/–	–2/–	5 6 8
Overseas Electricity Companies							
Atlas Elec.	4/–	1/6	Nil	Nil	1/9	–3d.	—
Calcutta Elec.	37/–	27/–	10*	8*	27/–	...	5 18 6
Cawnpore Elec.	30/–	25/–	10	10	25/–	–⅛	8 0 0
East African Power	25/6	23/3	7	7	23/6	–1/–	5 19 3
Jerusalem Elec.	24/–	21/6	7	7	22/–	–6d.	6 7 5
Kalgoorlie (10/–)	12/6	9/6	7½	7½	11/6	...	6 10 5
Madras	26/9	25/–	8*	6*	25/–	...	4 16 0
Montreal Power	35½	30	1½	1½	32	+1	—
Palestine Elec. "A"	25/–	21/–	7½*	5*	21/3	...	4 14 1
Perak Hydro-electric	20/3	14/6	6	2½	14/6	...	3 9 0
Shawinigan Power	27½	19	83cts.	90cts.	20½	+1	—
Tokyo Elec. 6%	69	52	6	6	52½xd.	...	11 8 6
Victoria Falls Power	75/9	60/–	12½	15	60/–	–½	5 0 0
Whitehall Investments Pref.	17/9	11/6	7½	7½	13/–	...	11 10 0
Public Boards							
Central Electricity :							
1950–70	110½	104	5	5	104½	–2	4 15 8
1955–75	112½	106	5	5	106½	...	4 14 0
1951–73	107½	102	4½	4½	102½	...	4 7 10
1963–93	96½	90	3½	3½	91½	–1	3 16 6
London Elec. Trans Gtd.	92	87½	2½	2½	89	–2½	2 16 2
London & Home Counties							
1955–75	113½	105	4½	4½	105½	...	4 5 4
Lond. Passenger Transport							
A	116	104	4½	4½	105	...	4 5 9
B	116	103	5	5	104½	...	4 15 8
C	65½	31½	1½	—	32½	...	—
West Midland Joint Elec.							
1948–68	106½	105	5	5	105½	–1	4 14 9
Telegraph and Telephone							
American Tel. & Tel.	215	180	9	9	190	+10	4 14 9
Anglo-Am. Tel. :							
Pref.	106	93½	6	6	96½	–2	6 4 4
Def.	23⅜	21	1½	1½	21½	...	6 19 6
Anglo-Portuguese	22/6	18/6	8	8	18/9	–⅛	8 10 8
Cable & Wireless :							
5½% Pref.	99½	72	4½	5½	77½	–5	7 2 0
Ord.	65	33	4	4	37½	–3	10 13 4
Income	99⅜	93	...	...	98½	...	4 1 5
Canadian Marconi $1	6/–	4/–	Nil	4cts.	4/3	...	—
Globe Tel. & Tel. :							
Ord.	32/6	27/–	7½*	6*	27/6xd.	...	4 7 3
Pref.	28/9	23/6	6	6	23/9	–6d.	5 1 1
Great Northern Tel. (£10)	20	11	20	20	12½	...	—
Inter. Tel. & Tel.	5½	3	Nil	Nil	3	...	—
Marconi-Marine	30/–	18/6	10	7½	18/9	–⅛	8 0 0
Oriental Telephone Ord.	2⅞	53,6	12*	11½*	2¾	...	4 3 8
Telephone Props.	15/–	12/6	5	6	12/6	...	9 12 0
Telephone Rentals (5/–)	9/6	6/6	10	10	6/9	–3d.	7 8 2
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	4/3	3/–	Nil	Nil	3/–	...	—
4% Inc.	11½	4	Nil	Nil	5½	...	—
British Electric Traction :							
Def. Ord.	830	450	5	5	500	–75	—
Pref. Ord.	169	147	8	8	160	–5	5 0 0
Bristol Trams	48/6	40/–	10	8*	41/3	...	3 17 8
Brazil Traction	12½	5½	$1	50c.	5½	–⅛	—
Calcutta Trams	24/–	20/–	8	8	20/–	...	8 0 0
Cape Elec. Trams	18/6	16/–	5	5	18/–	...	5 11 1
Lancs Transport	35/–	28/3	10	10	32/6	–½	6 3 1
Mexican Light :							
1st Bonds	33	27	5	5	30½	...	—
Rio 5% Bonds	90	74	5	5	80	...	6 5 0
Southern Rly. :							
5% Prefd.	79	38	5	5	40	–4	12 10 0
5% Pref.	104½	67½	5	5	70½	–9	7 1 10
T. Tilling	45/9	31/–	10	10	31/3	–2/–	6 8 0
Tilling & B.A	47/6	43/9	9*	8*	47/6	...	3 7 10
West Riding	35/–	28/6	10	10	32/–	...	6 5 0
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	15/–	15	15	17/6	...	—
Assoc. Elec. :							
Ord.	43/3	31/–	10	10	31/3	–½	6 7 10
Pref.	35/3	32/3	8	8	35/–xd.	...	4 11 5
Automatic Telephone & El.	47/3	37/6	12½	12½	37/6	–½	6 13 4
Babcock & Wilcox	50/–	33/6	10	11	33/9	–½	6 10 2
British Aluminium Ord.	56/–	42/6	12½	12½	42/6	–⅛	5 17 8
British Insulated Ord.	92/6	75/–	20	20	75/–	–⅛	5 6 8
British Thermostat (5/–)	14/9	11/9	18½	18½	12/6	...	7 8 0
British Vacuum Cleaner (5/–)	12/6	8/6	40	12½	10/–	...	6 5 0
Brush Ord.	4/6	2/–	Nil	Nil	2/6	–9d.	—
Callender's	69/–	54/6	20	15	55/–	...	5 9 1
Chloride Elec. Storage	72/6	67/–	20	15	3⅜	...	4 9 0
Consolidated Signal	72/6	59/–	36½	17	71/3	–⅛	4 15 4
Crabtree (10/–)	24/9	20/6	17½	17½	21/3	...	8 4 9
Crompton Parkinson :							
Ord. (5/–)	20/–	12/6	15	20	12/6xd.	–1/–	8 0 0
E. K. Cole (5/–)	5/–	3/3	10	Nil	3/6	–6d.	—
Elec. & Musical Industries (10/–)	10/3	5/–	5	Nil	5/3	–9d.	—
Electric Construction	36/3	32/6	12½	13½	32/5	–½	8 6 2
Enfield Cable Ord.	56/–	46/3	25	16½	48/9	...	6 13 2
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	...	5 0 0
English Electric	33/9	22/6	10	10	22/6	–½	8 17 10
Ensign Lamps (5/–)	15/3	13/9	25	25	13/9	...	9 1 10
Ericsson Tel. (5/–)	39/3	30/–	25*	25*	30/–	...	4 3 4
Ever Ready (5/–)	28/3	18/9	30	40	19/–	–⅛	10 10 6
Falk Stadelmann	18/3	17/6	10	6	17/6	...	6 17 4
Ferranti Pref.	25/–	23/–	7	7	25/–xd.	...	5 12 0
G.E.C. :							
Pref.	32/6	28/–	6½	6½	29/6	...	4 8 3
Ord.	83/3	60/–	17½	20	61/3	–⅞	6 10 6
Greenwood & Batley	25/6	21/3	15	15	22/6	...	13 6 8
Hall Telephone (10/–)	18/6	15/–	15	10	15/–	...	6 13 4
Henley's (5/–)	21/6	16/3	20	20	16/3	...	6 3 1
4½% Pref.	21/3	20/6	4½	4½	21/3	...	4 4 8
Hopkinsons	46/9	37/6	12½	15	37/6	–½	8 0 0
India-Rubber Pref.	21/–	20/–	5½	5½	20/9	...	5 6 0
Intl. Combustion	121/3	77/6	32½	32½	4¼	–⅜	7 17 9
J. Lucas	60/6	52/3	15	15	52/6	...	5 14 3
Johnson & Phillips	50/9	36/–	12½	15	36/3	–⅛	8 5 6
Lancashire Dynamo	59/9	52/6	25	20	52/6	...	7 12 6
Laurence Scott (5/–)	11/–	9/3	15	15	9/–	–6d.	8 6 8
London Elec. Wire	25/6	25/–	12	7½	25/–xd.	...	6 0 0
Mather & Platt	46/6	35/–	13½	10	35/–	...	5 14 3
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	...	5 3 6
Murex	86/9	62/6	20	20	62/6	–⅛	6 8 0
Pye Deferred (5/–)	9/–	7/–	25	25	8/6	–6d.	14 14 2
Revo (10/–)	20/9	16/3	17½	17½	16/3	–⅛	10 15 4
Reyrolle	60/6	45/–	12½	12½	45/–	–⅛	5 11 1
Siemens Ord.	23/9	17/3	7½	7½	17/6	...	8 11 6
Strand Elec. (5/–)	2/3	1/–	10	4	1/3	...	10 0 0
S. Smith (1/–)	8/–	5/–	37½	50	5/–	...	10 0 0
Switchgear & Cowans (5/–)	11/9	7/6	20	10	10/–	...	5 0 0
Telegraph Condenser (10/–)	8/9	6/3	5	—	8/9	...	—
Telegraph Construction	42/6	32/6	10	10	32/6	...	6 3 1
Telephone Mfg. (5/–)	9/–	6/6	9	9	6/6	–6d.	6 18 7
Tube Investments	96/9	70/–	23¾	23¾	79/–	–¾	6 17 2
Vactric (5/–)	3/6	2/–	4	Nil	2/6	–3d.	—
Vickers (10/–)	22/–	11/–	10	10	11/3	–⅛	8 17 2
Ward & Goldstone (5/–)	19/9	19/3	20	20	19/9	...	5 1 3
Westinghouse Brake	46/–	32/9	17½	10	37/6	–½	5 6 8
Walsall Conduits (4/–)	26/6	23/9	55	55	23/9	...	9 5 2
West, Allen (5/–)	7/–	5/–	10	7½	5/–	...	7 10 6

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Australia.—MELBOURNE. — July 16th. State Electricity Commission of Victoria. Underground cable. (T. 19853/40.)*

August 6th. Transformers for Kiewa No. 3 power station. (T. 19912/40.)*

Barking. — June 28th. Corporation. Electrical work at first-aid post and control centre, new Town Hall. (June 7th.)

Birmingham.—July 3rd. Electric Supply Department. AC and DC distribution boards. (June 14th.)

June 22nd. Telephone, staff locator and load indicator apparatus for the Hams Hall "B" power station. (See this issue.)

Carlisle.—Management Committee of the Cumberland Infirmary. Electrical installation in new operating theatre. E. Griffiths & Son, "Kinders," Bromborough, Cheshire.

Eire.—CARLOW.—July 10th. District Mental Hospital Board. Refrigerating equipment. N. Matthews, 104, Grafton Street, Dublin (deposit £5 5s.).

DUBLIN.—June 25th. Commissioners of Public Works. Electrical installation at New Government Offices, Kildare Street. Delap & Waller, 16, Molesworth Street, or F. D. Shortall, 10, Leinster Street (deposit £1).

London. — COMMISSIONERS OF HIS MAJESTY'S WORKS.—June 28th. Boiler feed water treatment plant in the North-Eastern area. Room 425, 4th Floor, H.M. Office of Works, Abell House, John Islip Street, S.W.1 (deposit £1).

Middlesbrough. — Electrical installations in further A.R.P. shelters in Newport Road. Borough engineer, Town Hall.

New Zealand.—CHRISTCHURCH. — July 18th. Electricity Department. Sixteen 200-kVA 10,500/415-V, 50-cycle, three-phase oil-immersed outdoor-type transformers. (T. 20327/40.)*

WELLINGTON.—July 24th. Post and Telegraph Department. Four heating and ventilating units, each comprising a centrifugal fan with motor, an air filter and an electric heater. (T. 20448/40.)*

Sleaford.—June 26th. Electricity Department. One 50-kW mercury arc rectifier. (June 14th.)

South Africa.—JOHANNESBURG. — City Council. July 10th. Ten 250-MVA and fourteen 150-MVA, triple-pole, oil-immersed circuit-breakers for use on a 6,600-V, 50-cycle system. (T. 20003/40.)* Box-type distribution fuse units. (T. 20005/40.)*

Distribution transformers. (T. 19831/40.)*

July 11th. Public Works Department. Electric lift at the new police mortuary, Johannesburg. (T. 20009/40.)*

August 6th. Railways and Harbour Administration. Electrical equipment, comprising high-speed circuit-breakers, isolating links, insulators, &c., and battery charging equipment. (T. 19785/40.)*

July 13th. Cut-outs for pole mounting. (T. 20410/40.)* 800 6,600-V, 300-A isolating links of the single or double bladed types. (T. 20409/40.)* 900 low-voltage lightning arrestors. (T. 20408/40.)*

July 25th. Union Tender and Supplies Board. Electric passenger lift. (T. 20406/40.)*

CAPE TOWN.—August 21st. Electricity Department. Extra-high-voltage line material. (T. 20418/40).* Transformer. (T. 20417/40).*

SALISBURY (SOUTHERN RHODESIA).—July 15th. Electricity Department. Electrical distribution materials. (T. 19595/40.)*

UMTALI (SOUTHERN RHODESIA).—July 26th. Municipality. Electrical material for use in the reconstruction of the electricity undertaking, including 3,300-6,600-V link cubicle, 3,300-V oil circuit-breakers, main e.h.v. receiving switchboard, ring main isolators and tee-offs, e.h.v. and l.v. cable, transand trifurcating boxes, and l.v. end dividing boxes. (T. 20472/40.)*

Straits Settlements.—SINGAPORE.—September 16th. Municipal Water Department. Pumping plant for the MacRitchie reservoir. (T. 20241/40.)*

Sunderland.—July 1st. Town Council. Choke and condenser mains filters, suppressors, electric kettles, boiling rings, and other electrical apparatus and equipment in connection with the extension of Cherry Knowle Hospital. Medical Superintendent, The Hospital, Ryhope.

Wolverhampton.—July 2nd. West Midlands J.E.A. Transmission line and cables and 11-kV distribution switchgear. (June 14th.)

Workington.—June 24th. Electricity Supply Department. Two 300-kVA transformers. (June 14th.)

Orders Placed

Bradford.—Education Committee. Accepted. Motor alternator for Technical College (£269).—Newton Bros. (Derby). Three-phase shifting transformer (£39).—H. Tinsley & Co.

Electricity Committee. Accepted. Steam piping for turbine at Valley power station.—Babcock & Wilcox. Ventilating plant at Bolton Road station.—Standard & Pochin.

Cardiff.—Electricity Committee. Accepted. Two 1,000-kVA transformers (£913).—Bryce, Ltd. Four 500-kVA transformers (£1,085).—Met.-Vick. Elecl. Co. Batteries and charging equipment for two substations (£354 each for batteries and stands, £97 each for chargers, and £35 for the erection of each battery at Heath estate and Sanatorium Road substations).—Edison Swan Electric Co.

Watch Committee. Accepted. Two fire alarms (£124).—Steljes Oral & Electrical Appliances Co.

Dover.—Electricity Committee. Accepted. Cables for one year.—Hackbridge Cable Co.; Siemens Bros.

Eire.—CORK.—Vocational E.C. Accepted. Electrical installation at the Technical Institute (£244).—R. Arthur & Co.

Eccles.—Highways Committee. Recommended. Traffic signals at Wirsley Road junction (£494).—Automatic Telephone & Electric Co.

Hull.—Education Committee. Accepted. Switch panel and control gear for Hopewell Road School.—Midland Electric Manufacturing Co.

Watch Committee. Accepted. Five amplifiers for police cars (£103).—Brown Bros.

(Continued on next page.)

Financial Section (*Concluded from page 666*)

Reports and Dividends

Callender's Cable & Construction Co., Ltd., reports a net trading balance for 1939 of £670,908, as compared with £448,612 for the preceding year. From this is deducted depreciation, £70,000; income tax, £200,000; N.D.C. and E.P.T., £30,000; debenture interest, £13,500; and preference stock dividends, £56,000, leaving £301,408. To this is added £390,548 brought in, making £691,956. The ordinary dividend for the year is maintained at 15 per cent., reserve for equalisation of dividends or war contingencies receives £125,000, and £398,369 is carried forward. The report states that the substantial increase in profits was mainly due to circumstances which developed prior to the declaration of war in September. The company's export trade has improved.

W. T. Henley's Telegraph Works Co., Ltd., reports a balance on trading account for 1939, after providing for taxation, bad debts and contingencies, of £415,204 (£445,159). From this is deducted directors' and auditors' fees and depreciation of buildings, machinery, &c., £71,351, leaving a net profit of £343,853 (£374,042). To this is added £411,894 brought in, making £755,747. A sum of £100,000 is transferred to the reserve account, and a final ordinary dividend of 10 per cent., less tax, is recommended, making 15 per cent. for the year, plus a cash bonus of 5 per cent., less tax. The distribution for the year is thus maintained at 20 per cent., and £384,331 is carried forward. Meeting: June 21st.

The Electric Construction Co., Ltd., reports a net profit of £57,363 for the year ended March 31st as compared with £88,962 for the preceding year. The preference dividend absorbs £7,000, and tax and N.D.C. £15,000, and it is proposed to pay an ordinary dividend for the year of 10 per cent., leaving £25,459 to be carried forward. The total distribution for the previous year was 13½ per cent., which included a bonus of 3½ per cent.

Hick, Hargreaves & Co., Ltd., report a trading profit for the year ended March 31st of £71,294, as compared with £64,608 for 1938-39, and a net profit of £37,800 (against £46,088), to which is added £4,524 brought in, making £42,324. The dividend for the year is maintained at 10 per cent. by a final dividend of 3 per cent., plus a bonus of 5 per cent.

Newton Bros. (Derby), Ltd., report a net profit for 1939 of £15,566 (£35,343). The dividend is maintained at 12½ per cent., but is paid on capital, which was raised to £78,992 by a 100 per cent. scrip bonus in June, 1939, reserve receives £1,000 (£28,201), and the carry-forward is increased from £7,119 to £11,517.

Peter Brotherhood, Ltd., report a net profit of £75,551 (£81,925), to which is added £104,266 brought in. A final ordinary dividend of 12 per cent. is recommended, making 20 per cent. for the year (as against 24 per cent.), sums of £7,500 and £10,000 respectively are provided for A.R.P. and special depreciation, and £118,242 is carried forward.

The British Electric Traction Co., Ltd., announces a revenue for 1939 of £745,874, as against £728,513 in the previous year. After deducting £67,646 for general expenses, income-tax, &c., £79,479 for debebenture stock interest providing £50,000 for E.P.T., there was a profit of £548,748 (£482,398). A final dividend of 30 per cent., less tax, is recommended on the deferred ordinary stock, making 45 per cent. for the year, and £28,789 is transferred to undivided profits account.

Keith Blackman, Ltd., announce a net profit for 1939 of £32,771 (£32,528). An ordinary dividend of 15 per cent. (same) is recommended and £30,483 (£29,400) is carried forward.

The Globe Telegraph and Trust Co., Ltd., has announced a final ordinary dividend of 2¼ per cent., tax free, making 6 per cent. for the year (against 7½ per cent.), and a bonus of 2½ per cent., tax free (same).

Meters, Ltd., reports a net profit for 1939 of £19,567, as against £25,160 in the previous twelve months. The final ordinary dividend is 6½ per cent., again making 9 per cent. for the year. A sum of £1,200 (£2,200) is allocated to taxation reserve, £2,200 (£5,000) to A.R.P. reserve, and £13,841 (£13,377) is carried forward.

The Victoria Falls & Transvaal Power Co., Ltd., has announced a final ordinary dividend of 11 per cent., making 15 per cent. for 1939 (same). The net profits were £681,789 (against £652,035).

The London Electric Wire Co. & Smiths, Ltd., has declared an interim dividend of 2 per cent. (unchanged).

The British Vacuum Cleaner and Engineering Co., Ltd., has announced that the dividend due on July 1st on the 5½ per cent. cumulative preference shares will be deferred.

C

Liverpool.—Watch Committee. Accepted. Telephone control desk fitted with loudspeaker equipment at the central fire station, Hatton Garden (£330).—Standard Telephones & Cables.

London.—WESTMINSTER.—Finance Committee. Accepted. Electric lighting alterations at Caxton Hall (£54).—Belshaw & Co.

Manchester. — Highways Committee. Accepted. Traffic signals at various road junctions.—Automatic Telephone & Electric Co.

Electricity Committee. Accepted. Wiring alterations and provision of new switchgear at premises in Miles Platting.—W. H. Smith & Co.

Water Committee. Accepted. Otto ozone producer plant.—English Electric Co.

Middlesbrough.—Town Council. Accepted. Installation of electric lighting and power at Hemlington Hospital (£804).—A. Anderson & Sons.

Scarborough.—Electricity Committee. Accepted. Water spray fire equipment for switch-house (£166).—Mather & Platt.

Stoke-on-Trent.—Electricity Committee. Accepted. Electrical goods for one year for the Public Works Department.—G.E.C.; H. W. Teeton.

Wallasey.—Electricity Committee. Accepted. Cables for two years.—B.I. Cables; Crompton Parkinson.

Warrington. — Electricity Committee. Accepted. Transformers.—Electric Construction Co.

West Hartlepool.—Town Council. Accepted, 5,000-kVA transformer.—Bryce, Ltd. P.i. cables.—Britannic Electric Cable & Construction Co.

York.—Joseph Rowntree Village Trust. Electric power and lighting at the new Earswick Senior Undenominational School. Secretary, Education Offices, County Hall, Northallerton.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bacup.—Houses, Clarence Street; D. W. Hall, 13, Hargreave Street, Bacup.

Bagshot.—Fire station, Chobham, for R.D.C.; surveyor, High Street, Bagshot.

Birmingham.—Warehouse and offices in Weaman Street; C. Bryant & Sons, builders, Whitmore Road, Birmingham.

Factory building, Bridge Street West; W. J. Whittall & Son, builders, Lancaster Street, Birmingham.

Factory and offices, Kingstanding Road; W. J. Whittall & Son.

Factory premises, Cheapside; Hy. Morgan & Son, builders, Birchfield, Birmingham.

Warehouse and offices, Upper Mill Street; Morriss & Jacombs, builders, Hob Moor Lane, Birmingham.

Blyth (NORTHUMBERLAND).—Cinema for Mr. Sheckman, of the Hippodrome, Blyth; E. M. Lawson, architect, Barras Buildings, Barras Bridge, Newcastle.

Bolton.—Works additions, Holland Street; Phillipson & Co., Ltd.

Works additions, Blackburn Road; T. M. Hesketh & Sons, Ltd.

Additions, Peel Mills, Turton Street; Knowles, Ltd.

Bournemouth.—Substation, Holdenhurst Road; Moore's, Ltd.

Bridgwater.—Extensions to Durleigh pumping station; R. A. Watson, borough engineer, Town Hall, Bridgwater.

Brighton.—Extensions to dairy premises, Islington Road, for Brighton Equitable Co-operative Society, Ltd., 94/101, London Road.

Bromsgrove.—Bungalows, Hagley, for H. Detheridge and Son, builders, Trinity Street, Old Hill, Dudley.

Burton-on-Trent.—Additions to tyre factory at Stretton for Pirelli, Ltd., Derby Road; Thos. Lowe & Sons, Ltd., contractors, Curzon Street, Burton-on-Trent.

Canterbury.—Fire station, corner of The Friars and Best Lane; city surveyor.

Chichester.—Pumping station and cottage; Sandford, Fawcett and Partners, 53, Victoria Street, London, S.W.1.

Sub fire station, East Wittering; borough engineer.

Consett.—Public shelter (300 persons), John Street, for U.D.C.; T. P. Leath, Council Offices, Blackhill.

Corby.—Houses (40), Oakley Road, for U.D.C.; Gotch, Saunders and Surridge, architects, High Street, Kettering.

Cradley Heath.—Extensions to offices, for Midland Iron & Hardware, Ltd., Lomey Town.

Stores and workshop, for A. E. Chapman & Co., Reddall Hill Road.

Dewsbury.—Works extensions, for J. Austin & Sons (Dewsbury), Ltd., Forge Lane.

Dukinfield.—Additions to rope works, for William Kenyon & Sons, Ltd., rope manufacturers.

Additions to works for extension of heavy machine shops; Daniel Adamson & Co., Ltd.

Edinburgh.—School shelters (£8,500), for E.C.; city architect, Corporation Chambers.

Glastonbury.—Additions to glove factory, Chilkwell Street; R. J. Draper and Co., Ltd.

Water treatment plant building, Street Road; Clark, Son and Morland, Ltd.

Gloucester.—Cinema, site of Theatre de Luxe, for Odeon Theatres, Ltd.; Harry W. Weedon and Partners, architects, Phœnix Chambers, 84, Colmore Row, Birmingham, 3.

Grantham.—Houses, Cherry Orchard site; Rudd & Son, Ltd., contractors, Wharf Road, Grantham.

Harrow.—Infectious diseases hospital (£14,360), Bentley Priory estate, for U.D.C.; J. S. Jones, engineer, Victoria House, Vernon Place, W.C.1.

Holderness. — Air-raid shelters; A. Andrews, Surveyor, Council Offices, Skirlaugh.

Kettering.—Works, Cambridge Street, for C. Dobson; Gotch, Saunders & Surridge, architects, Bank Chambers.

Kidderminster.—Extension to carpet works, Clensmore Road, for Spilsbury & Wilcox, Ltd., 3, Cross Street; Works Department, Spilsbury & Wilcox, Ltd., 3, Cross Street, Kidderminster.

Lancashire.—Additions to maternity wards at the Moorlands Infirmary, Rawtenstall, and provision of emergency operating theatre; S. Wilkinson, county architect, County Offices, Preston.

Lancaster.—Extension to works at St. Leonard Gate, for Waring & Gillow (1932), Ltd., North Road.

Manchester.—Crematorium; city engineer.

Factory, Bentley Street, Adair Street and Padgate Street, for G. Corner & Co., Ltd.; E. Ogden and Co., architects, 1, Ridgefield.

Showrooms and warehouse, 22 and 22a, King Street, and 13, South King Street, for Jaeger, Ltd., 30, King Street; Thomas Campion & Son, contractors, Devonshire Street, Ardwick, Manchester.

Factory extensions, Union Eyelet Works, Vesta Street, Ancoats, for Clifford Whatmough, Ltd.; D. Walton & Co., Ltd., Clarendon Road, Salford, 5.

Mansfield.—Commercial garage, Sylvester Street; A. Lane & Sons, architects, Leeming Chambers, Leeming Street.

Works additions, Union Street, for Harwood Cash & Co., Ltd., Lawn Mills.

Middleton.—Boiler house, &c., Market Street, for Jopson, Ashworth and Edmunds, Ltd., Kidclough Dye Works; Engineering Department, British Cotton & Wool Dyers' Association, 22, Cumberland Street, Deansgate, Manchester, 3.

Monmouthshire. — School clinic at Crumlin; C. L. Jones, County Hall, Newport, Mon.

Morley (YORKS).—Shelters at the Peel Street, Churwell and Gelderd Road schools; borough engineer.

Newcastle-on-Tyne.—Garage for R. Rankin & Sons, transporters, Ouse Street; Alnwick Construction Co., Ltd., Alnwick, Northumberland.

Old Hill (STAFFS).—Works extensions, Elbow Street, for E. Partridge & Co., Ltd.

Oswestry.—Public abattoir; G. E. Taylor, Municipal Buildings, Oswestry.

Plymouth.—Flats and 80 houses; city architect.

Reconstruction, City Hospital; city architect.

Health centre, St. Budeaux; city architect.

Rawtenstall. — Extensions, Victoria Works, Cloughfold, Rossendale, for Glendale Yarns, Ltd.

Redcar.—Hotel for Blayney and Co.; Marshall, Tweedy and Bourn, architects, Grainger House, Blackett Street, Newcastle-on-Tyne.

Redditch.—Additions to premises, Stredley, for English Needle and Fishing Tackle Co., Ltd.

Houses (80), Batchley Road and Ashtree Road; surveyor, Council House.

Rowley Regis.—Extensions to works, Tividale, for Norton's (Tividale), Ltd.

Extensions to offices, Cradley Heath, for Midland Iron and Hardware (Cradley Heath), Ltd.

Skelton-in-Cleveland.—Communal shelters at Carlin How for Skelton & Brotton U.D.C.; F. Wilkinson, Council Offices, Skelton-in-Cleveland.

Stretford.—Additions to works, Elsinore Road, Old Trafford, for E. Boydell & Co., Ltd.

Stroud.—Additions to Lightpill Ironworks; T. H. and J. Daniels, Ltd.

Sunderland.—Block of shops at High Garth Flats, for Corporation; J. E. Lewis, borough engineer, Town Hall.

Swansea.—Further A.R.P. shelters (£117,264); borough engineer.

Wakefield.—Warehouse, Henry Street; A. Haley & Co., Ltd.

Cold store, Horbury Road; Wakefield Borough Co-operative Society, Ltd.

Wallasey.—Extensions, central fire station (£12,000); borough engineer.

Warrington.—Warehouse reconstruction, Sandy Lane; Orford Tanning Co., Ltd.

Whiston.—Garages for auxiliary fire service and public health depôt, Delph Lane, for R.D.C.; Gornall and Wainwright, Britannic House, 8, Hardshaw Street, St. Helens.

Whitehaven.—Houses (100); borough engineer.

Business premises on site of Grand Hotel (destroyed by fire) for the Cumberland Motor Services, Ltd., Carlisle.

Wigan.—Houses, for the Great Acre Building Co., Wigan Lane, Wigan.

Wolverhampton. — Warehouse additions, Wadhams Hill; Cleland & Hayward.

Workshop, Lever Street; General Galvanisers, Ltd.

Police buildings, Salop Street; borough engineer.

Worksop.—County Court offices in Park Street; J. Haslam, architect, Newcastle Avenue, Worksop.

Worthing.—School shelters (£11,838), for E.C.; borough engineer.

Trade Mark Applications

AMONG recent applications for British trade marks are the following, objections against any of which may be entered within one month from June 12th:—

Norman (lettering and design). No. 605191. Class 9 (IV). Condensers, volume controls, resistances, fuses, transformers, smoothing chokes, loudspeakers, accumulators, stabilisers and microphones, all being electrical apparatus, and electrical soldering irons.—Norman Rose (Electrical), Ltd., Waveband House, 43, Lambs Conduit Street, London, W.C.1.

Spade (lettering and design). No. 611404. Class 9 (IV). Starting and lighting electric batteries for motor vehicles.—Auto Salvage, Ltd., The Green, Sunderland, Durham.

Mazdalux. No. 611612. Class 9 (IV). Electric switches and parts thereof. British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.